United States Department of Agriculture
Forest Service

North Shore Restoration Project

Draft Environmental Assessment

Upper Lake Ranger District, Mendocino National Forest, Lake County, Ca

April 2021

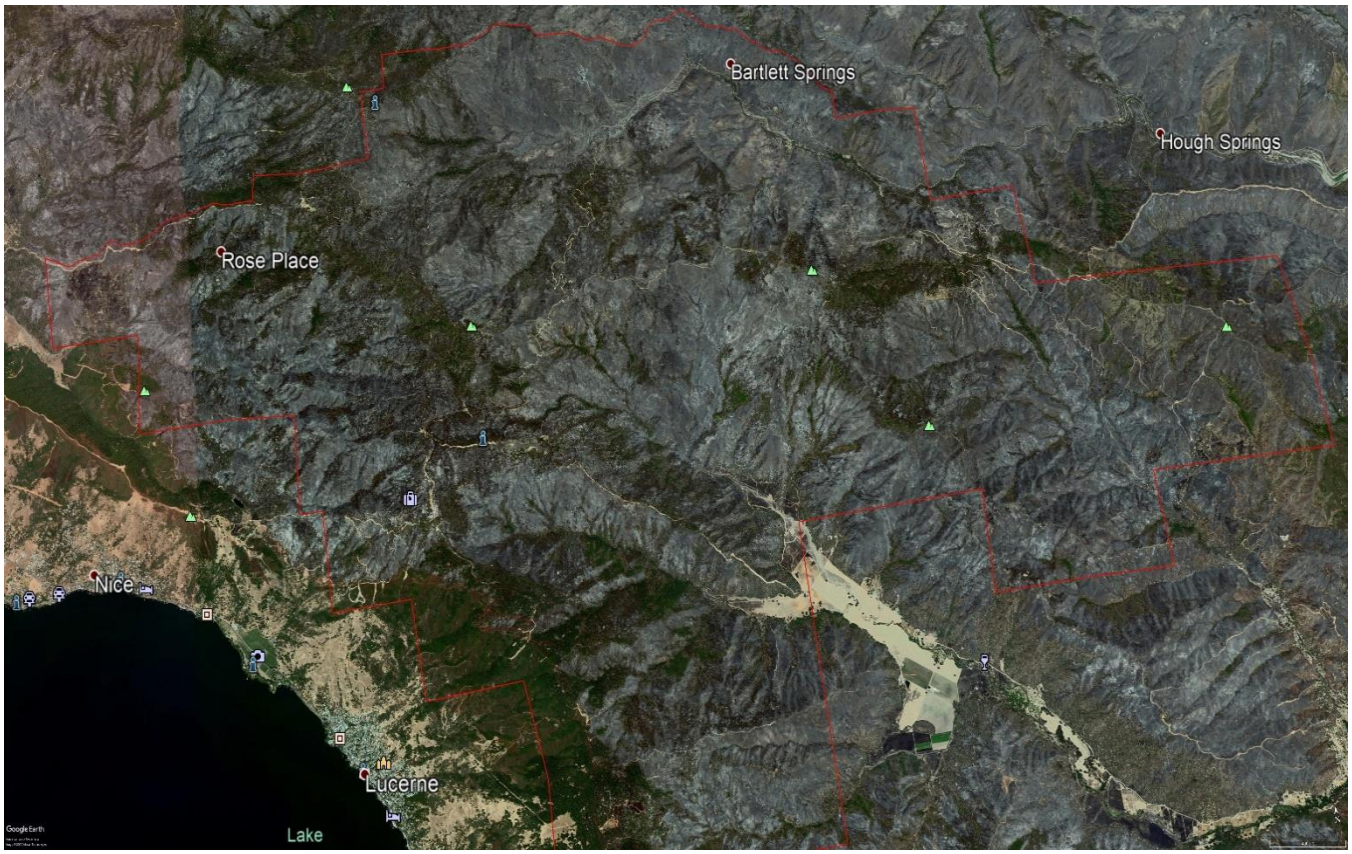


Figure 1: North Shore Restoration Project Area Aerial Map. Prepared by Hinda Darner using Google Earth Technology.

For More Information Contact:

Frank A. Aebly
USDA Forest Service, Pacific Southwest Region
Upper Lake Ranger District
Mendocino National Forest
Lake County, California
10025 Elk Mountain Rd
Upper Lake, CA 95485

Phone: 707-275-1410

Email: faebly@fs.fed.gov

Contents

List of Tables

List of Figures

Introduction

The Upper Lake Ranger District is proposing a project within the southern portion of the 2018 Ranch Fire on approximately 40,000 acres. This area is considered part of the wildland- urban interface, where National Forest System lands are in close proximity to residential communities, in this case Nice, Lucerne, Glenhaven and Clear Lake Oaks as well as private inholdings within the forest's boundaries. Some of the proposed actions include removing merchantable dead trees, nonmerchantable fuels treatment, reforestation, and treatment of invasive and noxious weeds. Additional details and a list of all proposed actions for the North Shore Restoration Project are described in the "Proposed Action and Alternatives" section of this document. These actions are proposed for the Upper Lake Ranger District of the Mendocino National Forest.

This environmental assessment was prepared to determine whether the North Shore Restoration Project might significantly affect the quality of the human environment and, thereby, require the preparation of an environmental impact statement. By preparing this environmental assessment, we are fulfilling agency policy and direction to comply with the National Environmental Policy Act.

Proposed Project Location

The project area is located about 11 miles southeast of the town of Upper Lake, California, in the foothills to the east and northeast of Lucerne, Glen Haven, and Clearlake Oaks along the north and northeast shoreline of Clear Lake. The project is entirely within the Mendocino National Forest and Berryessa-Snow Mountain National Monument. The project area also contains numerous parcels of private property. Proposed action and alternatives are confined to Mendocino National Forest land.

This landscape-scale project encompasses several seventh-field watersheds: Ally, Gilbert, Nice-Clear Lake, Lucerne-Clear Lake, Upper Long Valley, Middle Long Valley, Lower Wolf Creek, Upper Wolf Creek, Long Canyon, Kattenburg Canyon, Upper Bartlett, Lower Bartlett, Hospital, and Twin Valley (figure 2). Additional details about these watersheds and the affected environment can be found in the hydrology report (p. 36).

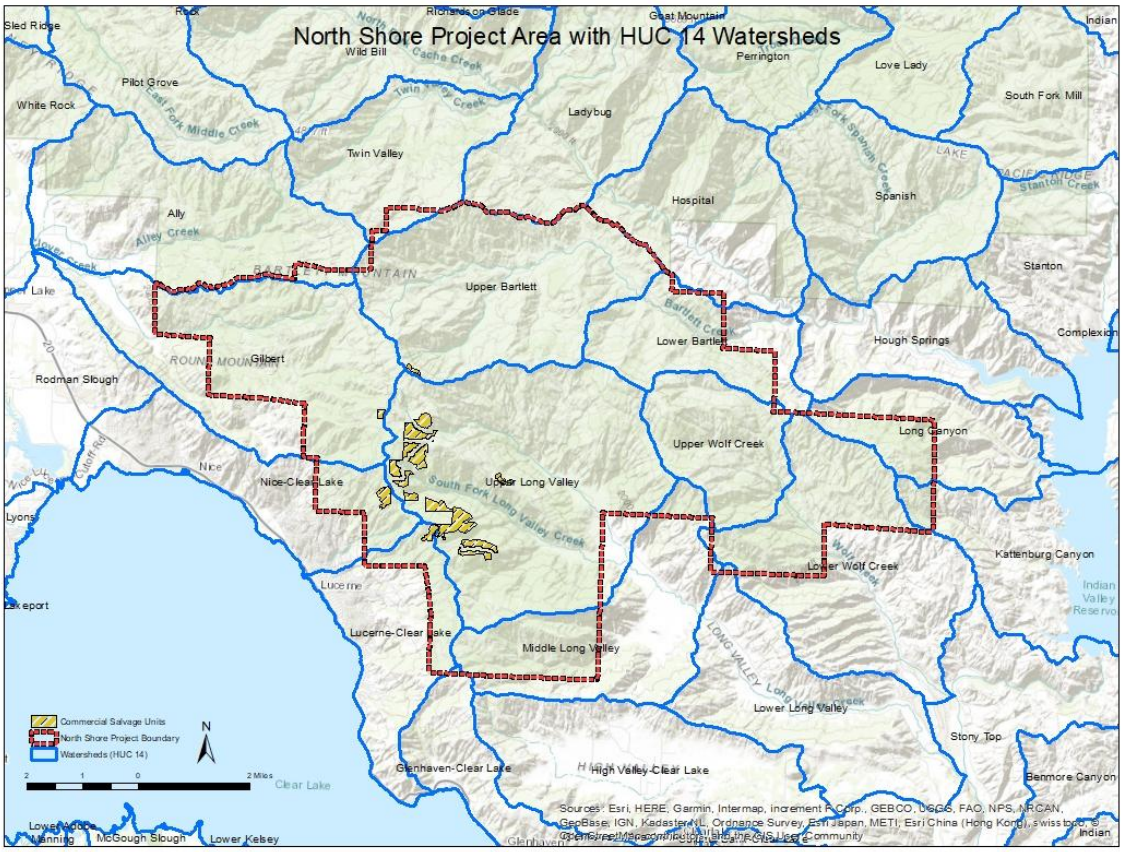


Figure 2. Project Area Map with Watersheds (Hydrologic Unit Code 14).

Historical vegetation communities within the project area are believed to have been influenced by a fire regime characterized by fairly frequent, but low to mixed severity, fires (figure 3) that created an open understory for the mixed-conifer forest habitat (Skinner et al. 2006). Refer to the “Botany” (p. 19) and “Silviculture” (p. 40) sections for more information on project area vegetation.

Average annual precipitation ranges from 30 to 42 inches, depending on elevation. Precipitation occurs primarily during late fall to spring months in the form of rain and light amounts of snow at higher elevations.

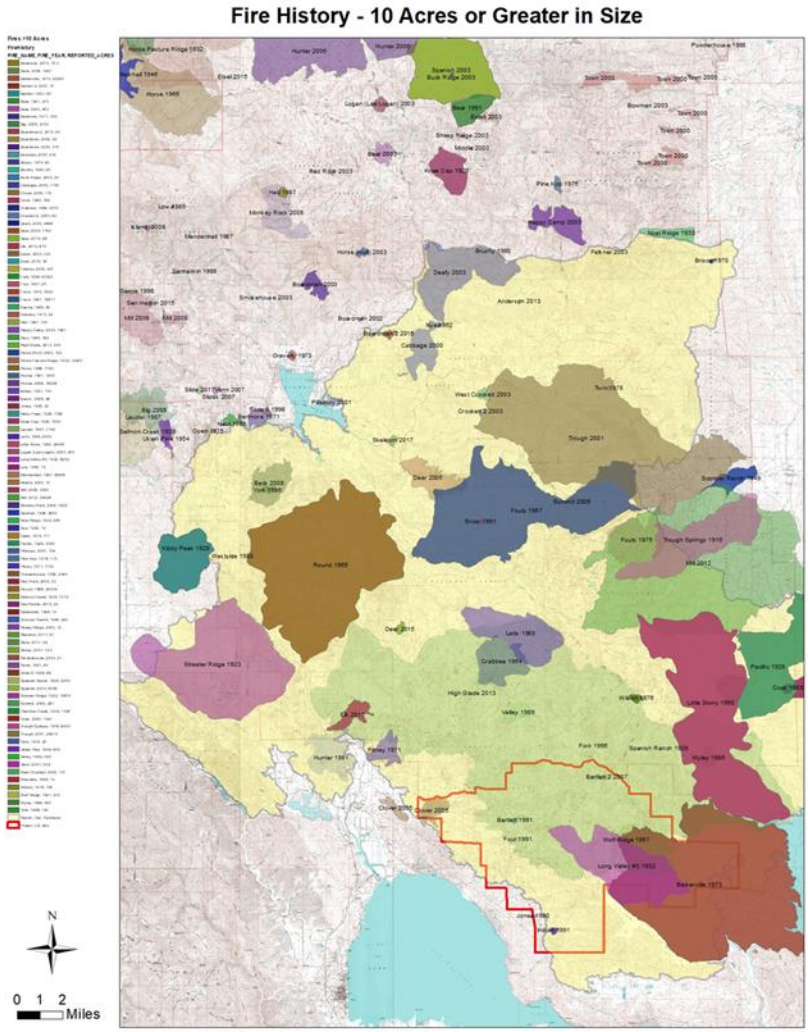


Figure 3. Project Vicinity Map with Fire History

Need for the Proposal

The North Shore Restoration Project is designed to improve community wildfire safety by reducing fuels within the wildland-urban interface, while also helping forest resources recover from the 2018 Ranch Fire. The Ranch Fire started on July 27, 2018 and burned more than 410,000 acres, about 288,000 of which are on the Mendocino National Forest. At its peak, the fire threatened 15,000 residences.

The project area focuses on a section of the fire that burned at a particularly high intensity. Fueled by extremely dry and dense vegetation, low humidity, and strong winds, the fire in this area consumed more than 48,000 acres within a 24-hour period. The Ranch Fire resulted in extreme effects across a large geographic area, impacting timber, soil, riparian areas, wildlife habitat, and heritage resources. The proposed action

aims to mitigate these effects, while improving public safety by reducing fuels in the project area adjacent to private land and nearby communities.

Existing Conditions

A cursory review of existing conditions reveals how the Ranch Fire has impacted vegetation, soil, fuel levels, archaeological sites, and the proliferation of invasive plants within the project area with the potential for longer term effects in the future.

As with most wildfires, the Ranch Fire burned through vegetation at varying intensities, leaving a mosaic of burn patterns on the landscape that range from unburned islands to large areas where the tree or shrub canopies were completely consumed. Within the project area, the burn mosaic was composed of mostly high severity areas: 70 percent of the landscape lost 90 percent or more of its existing vegetation as measured by basal area, while only 7 percent was unburned with no vegetation basal area loss. In areas that burned at high severity, natural tree regeneration is difficult because of the loss of seed sources.

Changes in vegetation structure and species composition is most prevalent in areas classified as “very high mortality” within the North Shore Restoration Project area. “Very high mortality,” defined as 75 percent or greater vegetation loss, affects about 76 percent of the project area. Burn severity at these levels essentially reset a forest’s growth and development to its beginnings. It effectively removes all mid- to late-successional habitat, leaving a novel landscape of early successional grasses, forbs, shrubs, and tree seedlings. This becomes the dominant vegetation on the landscape.

The remaining burn severity classifications within the project area include “high severity” (9 percent), “mixed severity” (7 percent), “low severity” (3 percent), and “unburned” (5 percent).

Figure 4 represents “very high” to “high severity” burns within the project area, while figure 5 exemplifies a “mixed severity” burns.

Figure 4. High Fire Severity to Very High Severity Fire

Figure 5. Mixed Severity Burn

Table 1 provides descriptions of all five burn severity classifications.

Table 1. Fire Severity

Class	Burn severity rate	Description
Unburned	**0 percent basal area loss**	Contiguous areas within the fire perimeter that did not experience fire
Low	**0-24 percent basal area loss**	Results from low severity fires where typically duff and ground vegetation were lightly burned many areas of unburned ground vegetation remain throughout the stand, and less than 25 percent of the dominant and co-dominant overstory trees were killed by the wildfire.
Mixed	**25-49 percent basal area loss**	Results from fires ranging from moderate severity in stands of mostly unburned overstory trees and low-to-moderate duff reduction and mortality of ground vegetation to moderately high severity fires that can significantly reduce duff burn large portions of ground vegetation, and kill up to 49 percent of overstory trees. The result is a mosaic that can include islands of green trees intermixed with scattered clumps of dead and live trees.
High	**50-74 percent basal area loss**	Results from high severity fire occurring in which duff and ground vegetation is nearly all consumed, leaving a quarter or less unburned or lightly burned, and from 5 to 75 percent of trees killed. These areas experience fire intensities that result in fire effects ranging from complete crown scorch to consumption of fine twigs and needles on standing trees.
Very High	**75-100 percent basal area loss**	Results in similar fire effects as under high severity burns with up to 100 percent of trees being killed. Extensive duff and ground vegetation burned to expose soil.

Table 2 describes how many acres within the project area burned at the various severity levels. It also shows the percentage of the total project area burned at the various severity levels.

Table 2. Project Area Burn Severity by Burn Severity Class and Acres

Burn Severity Classes	Percent Burn Severity within the Project Area by Burn Severity Classes	
	Acres	Percent Basal Area Loss
No Loss 0%	1791	5%
Low 0-24%	1335	3%
Mixed 25-49%	2750	7%
High 50-74%	3656	9%
Very High 75-100%	30277	76%

Figure 6 is a picture taken from Forest Road 14N01 looking northeast. The results of high and mixed severity burns are visible. The second ridge is Long Valley Ridge. The typical vegetation pattern is shrubland on the south-facing slopes, leading to conifer, hardwood, or conifer hardwood forestland on some extensive ridgetop areas, north-facing slopes, or within lower portions of canyon draws. The wildfire burned beyond the last ridge visible on the horizon.

Figure 6. Looking Northeast from 14N01

The wildfire resulted in tens of thousands of fire-killed trees that now cover the project area. This has resulted in an accumulation of hazardous fuels that exceed acceptable levels as described in the forest's land and resource management plan.

As these fire-killed trees decay and fall, they will accumulate on the ground as surface fuels. When combined with low-lying vegetation that is growing back, these excessive fuel levels can lead to higher intensity wildfires in the future, repeating the damage to soil, hydrology, and vegetation (Coppoletta 2016).

Similar to vegetation burn severity, wildfires can also burn soil at varying intensities. The Ranch Fire created a mosaic of soil burn severity, with a large proportion of the project area's soil being burned at a moderate severity. In areas of moderate and high burn severity, soil can undergo biological, chemical, and physical changes. Loss of vegetative cover, duff, and root systems can result in increased erosion and land instability.

Large wood on the ground, in particular, can burn at a high intensity for a prolonged period of time, causing the underlying soil to become so damaged that it repels water, is depleted of fungal and microbial communities, and exacerbates erosion (Smith 2017).

The predominant geology of the project area is Franciscan assemblage, which is primarily composed of greywacke sandstones and siltstones. This geology is prone to landslides when wet and can be highly erodible without vegetative cover when dry.

More than 400 archaeological sites have been identified within the Ranch Fire burn area. Of these sites, 47 are located within the Northshore project area. These sites consist of both prehistoric and historic resources and date from the historic period to thousands of years old. Not only are artifacts lost or compromised during a wildfire fire, but they also can become buried by landslides or eroded sediment from the denuded landscape (Ryan 2012). The exposed landscape can also make archaeological resources susceptible to looters and collectors. Falling hazards created by the overabundance of standing dead trees can make accessing known sites or the locations of potential new sites unsafe. Sites can again become threatened if excessive fuel loading results in more uncharacteristically severe wildfires in the future.

Nonnative invasive plant species often invade and spread exponentially after fires. They take advantage of the increased sunlight, soil moisture, and physical space after wildfires remove the forest canopy and previously established native plant communities (Johnson 2006). If allowed to take root and left unchecked, these invasive species can drastically alter the ecological integrity of an ecosystem (USDA 2020).

Purpose and Need for Action

The purpose of the North Shore Restoration Project is to move resources within the project area from their existing conditions as earlier described to the following desired results:

- Surface fuel levels will be kept at a level that will minimize the likelihood of future high-intensity fires (USDA 2020, p. II-29), but still provide sufficient cover for soil conservation and wildlife habitat. ((USDA 1995, p. IV-21).
- Forest roads will remain clear of fire-killed trees for dependable travel access and motorist safety. (USDA 1995, p. IV-29.)

- Fuel reduction activities will leverage the value of burned timber and forest products to benefit local economies and minimize costs to taxpayers. (USDA 1995, p. IV-38)
- Standing and downed dead trees will be retained at levels and sizes that support a variety of wildlife habitat needs. (USDA 1995, p. IV-35; USDA 2020, p. II-22)
- Landscapes will be dominated by site-appropriate tree species at variable densities and sizes to provide a diversity in forest structure, habitat connectivity, forest products, and forest habitat for wildlife. (USDA 1995, p. III -7.)
- Protect remaining areas of unburned vegetation and other residual legacy elements
- Plant communities will be dominated by native vegetation and free of noxious weeds. (USDA 1995, p. IV -2; USDA 2020, p. II-28)
- The science community will gain a better understanding of fire effects and post-fire management and recovery by partnering with researchers to conduct studies within the project area. (USDA 1995, p. V-1, B-3).
- Public involvement in restoration activities will increase through partnerships with community schools and Tribes. (USDA 2012, Planning Rule).

These desired results conform with the Mendocino National Forest's land and resource management plan and the Region 5 "Ecological Restoration Leadership Intent" publication (USDA 2015).

Need for Action

The discrepancies between the existing conditions and the desired results provide the basis for the need for action. Specific indicators are presented below to compare differences between alternatives.

Reduce post-fire fuel loading and prevent the buildup of excessive future fuel loads. The indicator used for this purpose and need would be fuel loading (measurement: tons/acre).

The proposed project is needed because the Ranch Fire resulted in severe effects to forest resources such as timber, soil, riparian areas, wildlife habitat, and heritage resources over an unusually large area. The innumerable fire-killed trees will contribute to extremely high fuel loading over time. This fuel loading will result in increased potential wildfire intensity and will jeopardize the ecosystem's ability to recover.

Reduce wildfire risk, improve resiliency to future wildfires, and identify opportunities to collaborate with local and State agencies to reduce wildfire risk. Indicators used for this purpose and need include fuel loading (measurement: tons/acre) and number of partnership opportunities identified.

Hundreds of thousands of dead trees dominate the existing post-fire conditions in areas that burned in high and moderate severity. Dead trees eventually fall to the ground and

create heavy fuel loads that increase fire intensity, duration of burning and difficulty for fire suppression. Future fires in the project area raise the potential for fire to spread rapidly throughout the landscape. Without treatment, hazardous fuels would increase and threaten reestablished trees and neighboring communities.

In areas of high and moderate fire severity, fire-affected trees will fall to the ground and become down woody material, creating hazardous surface fuel conditions. Down trees will increase surface fuel loads and leave reforested areas more vulnerable to future high severity wildfires (Skinner and Weatherspoon 1996, Ritchie et al. 2013). This downed material, combined with newly established vegetation, would make a new fire in the project area difficult to control (Brown et al. 2003, McIver and Ottmar 2007). These downed trees left unattended present a long-term risk to the area because of its arid Mediterranean summer climate. These climatic conditions slow the rate of decay and decomposition, meaning heavy fuels could remain on the ground for 30 years or longer before decomposition or fire removes them from the fuel load (Wagener and Offord 1972).

Long, dry summers contribute to the risk of a lengthy period for future wildfire events. Wildfires are caused by several sources. The Mendocino National Forest routinely experiences lightning and has a history of being affected by human-caused ignitions. Historically, ignitions in the foothill communities below the project area are common throughout the summer. The risk of future wildfire in the project area necessitates appropriate fuel load management to protect resources vulnerable to wildfires, such as timber and wildlife habitat. Other values at risk include private inholdings within and adjacent to the project area and the local communities of Lucerne, Nice, and Clearlake Oaks. The Lake County Community Wildfire Protection Plan specifically identifies these communities as high priority areas needing wildfire protection measures (LCCWPP 2009, p. 8-2).

Remove fire-killed trees to provide for employee and public safety. Indicator used for this purpose and need would be hazard tree removal (measurement: miles of road treated).

Trees have been affected by the fire in a way that they are a threat to the safety of the public, forest workers, and fire suppression crews. Desired conditions are that the forest transportation system be hazard free. There is a need for the project to ensure safety of the public, nearby communities, Forest Service personnel, and contractors using forest roads, as well as maintain open roadways for firefighting personnel access interior portions of the forest wildfire prevention and suppression activities.

Protect remaining areas of unburned vegetation and other residual legacy elements. Indicator used for this purpose and need would be fuel loading (measurement: tons/acre)

Because these areas provide valuable remnant wildlife habitat and seed sources for natural regeneration, it is necessary to protect these remaining areas of unburned

vegetation or areas of lower severity burn by reducing fuel loads. Without fuel reduction treatments, the increased risk for high intensity wildfire around these areas has the potential to lead to the loss of these values in the next wildfire.

Restore vegetation as appropriate for future environmental conditions and slope stability. Indicators used for this purpose and need include reforestation (measurement: acres planted) and release treatments (measurement: acres treated by hand, with herbicides, or mechanically).

Because of the size and severity of the Ranch Fire within the project area, there are limited seed sources or surviving trees to regenerate the forest naturally. Manually planting tree seedlings will accelerate the reforestation process and re-establish forested areas at densities and compositions appropriate for this frequent-fire landscape. Re-establishing forests soon will also help stabilize the soil and reduce erosion as fire-killed trees and their roots rot and lose their ability to hold soil.

Recover economic value of forest products. The indicator used for this purpose and need would be timber volume (measurement: thousand board feet [MBF]).
Leveraging the value of commercially viable forest products within the project area is a cost effective means of achieving restoration or fire safety objectives, supporting local economies, and minimizing the cost to taxpayers having to pay for similar work that could have otherwise been accomplished through commercial means. Typically conducted through a timber sale, provisions in the sale contract direct the purchaser on what trees to remove or retain to achieve the desired restoration or wildfire mitigation objectives. It's critical to conduct these sales sooner than later to minimize the time for rot and decay to set in or for trees to become a falling hazard.

Restore, enhance, and protect wildlife habitat, habitat connectivity, and native plant communities. Indicators used for this purpose and need include: treatment of invasive plants (measurement: acres treated and acres treated with herbicide [includes risk of spread]), meeting aquatic conservation strategy objectives (measurement: miles of temporary roads closed upon completion of use), and preserving or restoring northern spotted owl habitat (measurement: habitat unchanged).

Although some wildlife species thrive in burned landscapes, many do not, including the federally threatened northern spotted owl. It is, therefore, necessary to protect or enhance the remaining areas of high-quality terrestrial wildlife habitat, as well as to restore affected habitat and connectivity between areas of suitable habitat. Additionally, fire must successfully be restored into the ecosystem to sustain delivery of these ecosystem services.

One of the most serious threats to native plant communities after wildfire is non-native invasive plant species, which may colonize disturbed areas. Non-native invasive plant species have the potential to outcompete native species and disrupt ecological processes sufficiently to alter plant community development. Treating invasive plant species soon after a fire will require far fewer resources than trying to treat them years later after they've become established.

Restore recreation opportunities, particularly public access. Indicator used for this purpose and need would be hazard tree removal (measurement: miles of road treated).

Many recreational activities within the project area depend on vehicle access. Consequently, there is a need to maintain and repair roads to ensure safe travel. Road maintenance is also needed for implementation of project activities.

Support research opportunities to improve understanding of the effects of large wildfires and post-fire treatments. Indicator used for this purpose and need would be number of research partnerships.

At the time, the Ranch Fire was the largest wildfire in California history. The varying degrees of fire severity across large areas provide a unique research opportunity to answer questions, including the role and impacts of salvage logging. The regimented monitoring required of research will provide a robust review of conditions before treatment, as well as what results in the short and long term.

Partnerships with community schools and Tribes to provide opportunities for involvement in restoration of National Forest System lands. The indicator will be the number of community organization responding to outreach.

The participation of interested persons, organizations, Tribes, and state and local governments is encouraged throughout the development of this project. The intent of public participation is to provide the opportunity for the public to share its knowledge of existing forest conditions and to identify concerns about trends and perceptions of risks to social, economic, and ecological systems. Public participation also supports the development of relationships with and among members of the public and can contribute to a common understanding of current conditions and available data.

Refer to Table 3 for comparison of treatment based on Alternatives.

Table 3. Resource Indicators for each Alternative.

RESOURCE INDICATORS	Measurement (quantify if possible)	Alt. 1 No Action	Alt. 2 Proposed Action (PA)	Alt. 3 PA with Limited Herbicide Use	Alt. 4 PA with No Herbicide use	Alt. 5 PA to include Limited Cutting (<21" DBH)

RESOURCE INDICATORS	Measurement (quantify if possible)	Alt. 1 No Action	Alt. 2 Proposed Action (PA)	Alt. 3 PA with Limited Herbicide Use	Alt. 4 PA with No Herbicide use	Alt. 5 PA to include Limited Cutting (<21" DBH)
Miles of temporary roads closed upon completion of use.	Miles	0	3.9	3.9	3.9	3.9
Acres treated to control invasive plants with herbicide and risk of spread	Acres	0	435	435	0	435
Fuel Loading	Tons/Acre	82	10	10	10	46
Hazard tree removal	Miles of road treated	0	30	30	30	30
Percentage of Fuel Load Reduced 10 Years Out	Percent Reduction	0	90%	90%	90%	43%
Present Sale Volume	Estimated Board Foot Volume	0	5000	5000	5000	2000

RESOURCE INDICATORS	Measurement (quantify if possible)	Alt. 1 No Action	Alt. 2 Proposed Action (PA)	Alt. 3 PA with Limited Herbicide Use	Alt. 4 PA with No Herbicide use	Alt. 5 PA to include Limited Cutting (<21" DBH)
Reforestation	**Acres planted (approximate)**	**0**	**2694**	**2694**	**2694**	**2102**
Release Treatment using Herbicide	**Acres Released (approximate)**	**0**	**1080**	**530**	**0**	**840**
Partnerships, Research	**No opportunity**	**Significant opportunity for partnership and research**	**Significant opportunity for partnership and research**	**Significant opportunity for partnership and research**	**Significant opportunity for partnership and research**	**Substantially limits partnership and research opportunities**
Number of Acres of NSO habitat changed/ unchanged	**Acres**	**Unchanged**	**Unchanged**	**Unchanged**	**Unchanged**	**Unchanged**

Public Involvement and Tribal Consultation

A legal ad was placed in the Chico Enterprise Record on April 15, 2019, initiating the scoping period for this project. A public open house was held at the Lucerne Alpine Senior Center on May 9, 2019 to allow for the local community to learn about the project and ask questions. Thirty-three members of the public came to the open house. Eighteen responses were received from the open house including letters sent to the district. Over 100 persons/groups of interests and landowners who own parcels within and adjacent to the project area were contacted during this initial scoping period. In

addition, several District staff were approached outside of work to inquire about post fire activities and requesting involvement such as engaging students in planting of conifers and oaks.

The Forest Service consulted the following Federal, State, Tribal, and local agencies during the development of this environmental assessment:

California Water Quality Control Board- Central Valley

National Marine Fisheries Service, NOAA

US Fish and Wildlife Service

Natural Resource Conservation Service

CalFire

Lake County Fire Safe Council

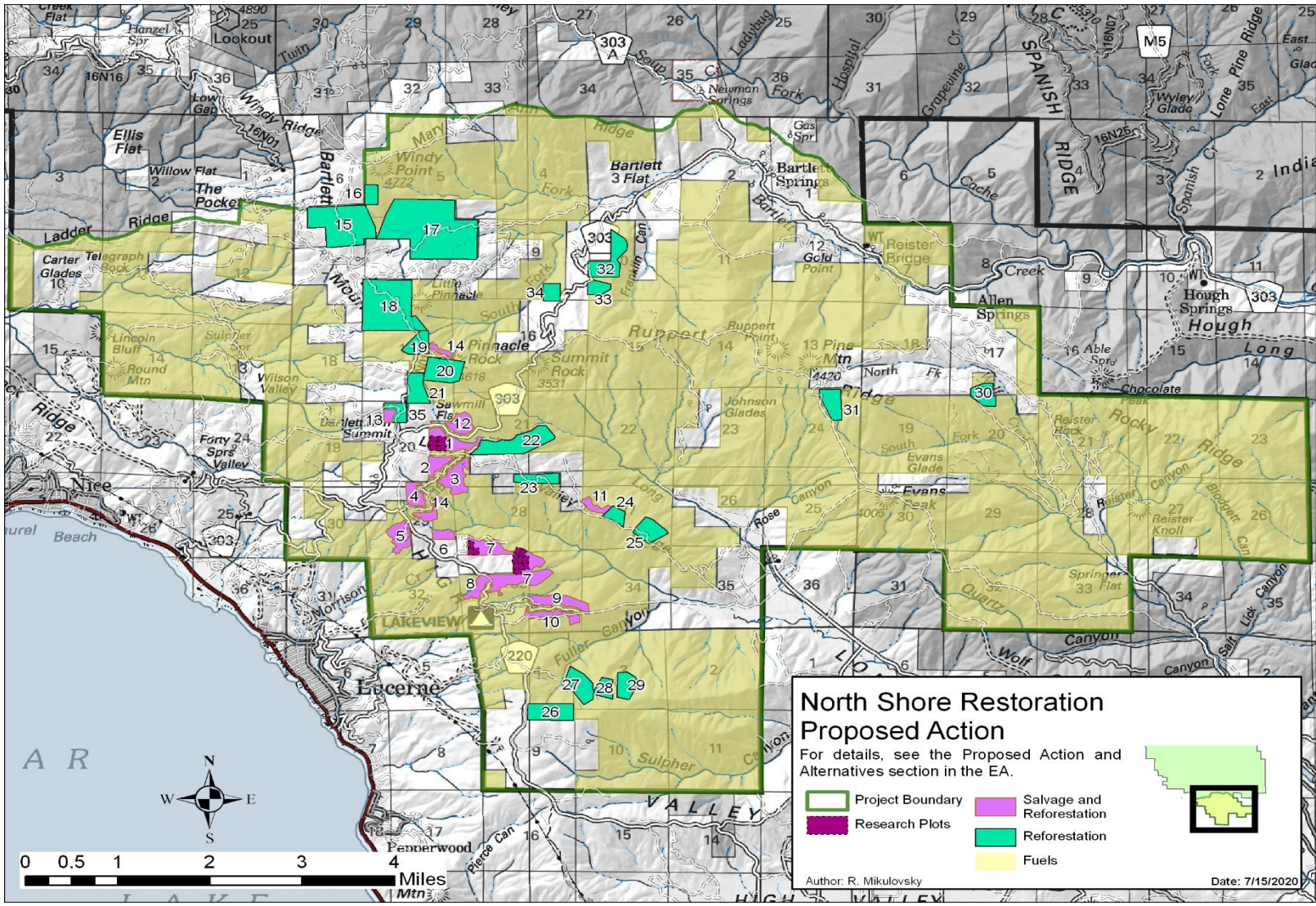
Scotts Valley Band of Pomo Indians

Elem Indian Colony

Robinson Rancheria

Hebematolel Pomo of Upper Lake

Proposed Action and Alternatives



The following map (Figure 7) represents locations of proposed action treatment units.

Figure 7. North Shore Restoration Proposed Action Map.

The proposed action and following alternatives were considered:

No Action Alternative (Alternative 1)

Under the No Action alternative none of the proposed management activities would be conducted.

Proposed Action (Alternative 2)

To reduce current and future fuel loading, reduce wildfire risk, improve resiliency to fire, and protect unburned areas and legacy components, the following treatments are proposed as directed by the Land and Resource management Plan (LRMP):

Salvage harvests are proposed to utilize merchantable timber killed or seriously damage by fire (LRMP Pg. IV – 38). To capture economic value, removal of commercial fire-killed or fire-injured trees will be identified by using the Marking Guidelines for Fire-Injured Trees in California (Smith et al. 2011).

Fuel reduction treatments may be applied as mechanical and/or hand treatment, including pre-commercial and commercial thinning; mastication; cut-and-pile; and prescribed fire; including understory burning, chaparral burning and pile burning. In many cases multiple treatments will be needed. (LRMP Pg. IV – 21).

The project proposes to reestablish and/or create new fuel breaks to provide strategic areas for future prescribed burning activities and suppression efforts (LRMP Pg. IV –63).

To restore vegetation, especially in areas lacking sufficient seed sources, a reforestation plan will be implemented (see Appendix E: topic Reforestation). Treatments will include planting appropriate conifer and hardwood species within identified treatment units. Variable-density planting and site preparation will occur where appropriate. After planting, manual, mechanical, and herbicide treatments will be used to thin and release planted trees. Aerial methods will not be used for herbicide treatment. (LRMP pg. IV 36-38)

To restore and protect wildlife habitat and connectivity, treatments will incorporate protection of existing habitat structure. Design features to develop future habitat structure will endeavor to meet landscape-wide connectivity needs. The actions include developing a live-tree retention standard, a snag retention standard, a woody debris standard, and incorporating wildlife habitat needs into the reforestation planting plan to enhance connectivity within and among units wherever possible (LRMP Pg. IV –30).

To protect and restore native plant communities, both forested and other types, an invasive plant management plan will be developed (see Appendix C: Invasive Plant Management Plan). As part of this plan, infestations of invasive plants will be treated with manual, mechanical, cultural, and/or herbicide treatments. Aerial methods will not be used for herbicide treatments (LRMP Pg. IV –2).

To ensure safe travel and restore public access and recreation opportunities, a road maintenance plan will be developed as part of the timber sale contract. These may be similar to recent projects such as the Bartlett Hazard Tree Abatement project (Bartlett C Provision Tables). Prescribed thinning treatments will remove hazardous roadside trees, and an erosion control plan will address slope stability and sedimentation to protect water quality (LRMP Pg. IV –65).

When the LRMP was written Appendix B listed some research and technical needs for the forest (LRMP Appendix B, Pg. B-1-B-3). Today we recognize that needs have changed and have included research for post fire management. To promote research opportunities on the effects of large fires and post-fire management, this project

proposes both current and possible future research. One such research project is being developed by the Pacific Northwest Research Station (PNW) Pacific Wildland Fire Sciences Laboratory. This project will establish a replicated-longitudinal study investigating the consequences/effects of post-wildfire salvage and will include a series of permanent research plots. This monitoring program will study the effects of large, high-severity fires and restoration treatments on future wildlife, conifer seed dispersal, tree recruitment, slope stability, soil erosion, aquatic resources, and dead and live fuel succession. It will also track long-term forest resilience and the conservation of native plant and animal species associated with the project area habitats.

If a salvage sale is unsuccessful then a service contract will be used to replicate salvage logging activities. This would result in decked logs that would need to be disposed of through other means (burning, biomass, etc.).

Alternative 3: Proposed action with limited use of herbicides

This alternative follows the actions of Alternative 2 with limited herbicide use. Under this alternative, herbicide use for release treatments will be limited to research plots. Use of herbicides to control invasive plants will remain the same as Alternative 2.

Alternative 4: Proposed action with no herbicide use

This alternative follows the actions of Alternative 2 without the use of herbicides.

Alternative 5: Proposed action to include limited cutting

This alternative follows the actions of Alternative 2 but includes the retention of all standing snags and Coarse Woody Debris greater than 21” DBH.

Environmental Impacts of the Proposed Action and Alternatives

This section summarizes the potential impacts of the proposed action and alternatives for each impacted resource.

Aquatics

There are no Threatened or Endangered aquatic species or associated Critical Habitat listed within the North Shore project area. The following species are considered Forest Service Sensitive for Region 5, and they are known or expected to occur on the Mendocino National Forest. Refer to Table 4 for a summary of direct and indirect effects and associated species determinations. For a detailed description of effects to aquatic species refer to the North Shore Restoration Project Biological Evaluation (https://www.fs.usda.gov/project/?project=55716).

Table 4. Summary of Direct and Indirect Effects and associated Species Determinations

Species	Direct and Indirect Effects	Alternatives	Determinations

Species	Direct and Indirect Effects	Alternatives	Determinations
Foothill Yellow Legged Frog and Western Pond Turtle	No direct or indirect impacts to the frog or turtle due to riparian reserves and streamside management zones and associated design criteria (Appendix B of EA) and distance to perennial streams.	All Alternatives	No impact
Pacific Lamprey, Western Brook Lamprey, Hardhead	No direct impacts due to barriers that block these species access to historic habitat within project area. No indirect impacts due to BMPs (see Appendix B of EA), small amount of commercial harvest, and distance from fish bearing streams	All Alternatives	No impact
Clear Lake Hitch	Potential to be impacted during water drafting from Clear Lake, which is outside of the project area (screens will be used to minimize potential impacts).	Alternatives 2-5	May impact individuals, not cause a trend towards federal listing
		No Action – Alternative 1 (short term)	No impact

Botany

Special Status Plant Species

Most of the project units were previously surveyed in 2010 for the Lakeview Hazardous Fuels Reduction project; approximately 400 acres of additional units were surveyed for botanical resources in 2019. There is one known occurrence of the Forest Service Sensitive plant species *Calycadenia micrantha* within the project boundary. It is southwest of Little Pinnacle and within reforestation unit #4. This occurrence was also within a recent roadside hazard tree removal unit; the site was flagged for avoidance.

There are no known federally Threatened, Endangered, Proposed, or Survey and Manage plant species within the project area. Suitable habitat for each of the listed

plant species is addressed in the Botany specialist report (https://www.fs.usda.gov/project/?project=55716).

Invasive Plant Species

The Ranch Fire area was widely (although not completely) surveyed for invasive species in 2019, especially targeting areas near roads and suppression disturbance. Based on these and previous surveys, there are 253 mapped locations of 13 different non-native invasive species within the North Shore project area. These sites comprise a total of 435 acres; see Table 5 below.

Table 5. Summary of invasive plant species found in the North Shore project area.

Species	Common Name	# Sites	Acres	Priority
Bromus madritensis ssp. rubens	Red brome	17	169.1	3
Bromus tectorum	Cheatgrass	20	109.6	3
Carduus pycnocephalus	Italian thistle	13	8.9	2
Centaurea melitensis	Maltese starthistle	9	1.6	2
Centaurea solstitialis	yellow starthistle	32	6.4	2
Cirsium vulgare	bull thistle	32	23.4	2
Foeniculum vulgare	sweet fennel	1	0.1	1
Hypericum perforatum	Klamathweed	56	10.8	2
Melilotus officianalis	white sweet clover	1	0.2	1
Rubus armeniacus	Himalayan blackberry	8	5.3	3
Spartium junceum	Spanish broom	2	0.4	1
Taeniatherum caput-medusae	medusahead	14	3.9	2
Verbascum thapsus	common mullein	48	95.7	2
TOTAL		**253**	**435.4**	

Each species is assigned a priority rank for treatment. Priority rank 1 species are targeted for eradication in the project area, due to the presence of very few sites and very little total acreage. Priority 2 species are targeted for control, with eradication of small and/or remote sites. Priority 3 species are generally fairly widespread on the landscape and are targeted for containment. In addition to the species-level priority ranks, certain sites, such as landings, parking and staging areas, will also be assigned a higher priority for treatment.

Direct and Indirect Effects (summary)

Direct effects of all action alternatives involve physical damage to plants or their habitat. Tree harvest and fuels reduction operations have the potential to directly affect plant species, resulting in death, altered growth, or reduced seed set through physically breaking, crushing, burning, scorching, or uprooting plants. Herbicides, formulated to kill plants, have the potential to injure or kill plant species upon contact, depending upon the selectivity of the herbicide, timing of the application, and sensitivity of the plant

species. Direct effects of herbicides vary according to the chemical composition and application rate of the herbicide.

Indirect effects are separate from an action in either time or space. These effects, which can be beneficial or detrimental to special status species, may include changes in plant community composition or indirect effects of herbicide application, such as off-target drift, surface runoff, or leaching. Invasive plant treatments are completed with the intention of altering plant community composition by decreasing invasive plant cover and increasing the habitat available to native plant species, including special status plants. Indirect beneficial effects are one of the primary goals of the control and eradication of invasive plants when they occur in suitable habitat for rare plants or in close proximity to existing occurrences of rare plants, and for native vegetation community composition.

Current inventories of Sensitive plant species capture the impact of past human actions and natural events, and are therefore implicit within the existing conditions. Cumulative effects could occur when the direct and/or indirect effects of one of the action alternatives on a given species add incrementally to the effects of past, present, and reasonably foreseeable future actions.

For botanical resources, some impacts will not change regardless of alternative. These analyses are grouped as appropriate to minimize repetition.

Biological Assessment (Botany)

According to the US Fish and Wildlife Service, possible listed plant species in the project area include the Threatened *Howellia aquatilis* (water howellia) and Endangered *Sidalcea keckii* (Keck's checker-mallow).

Water howellia is a small aquatic annual that occurs in the draw-down zone of small ponds that are shaded by forest vegetation. It is currently known on the Mendocino National Forest from seven ponds in the Covelo Ranger District; the nearest occurrence is almost 50 miles from the North Shore project area. There are no occurrences of water howellia nor suitable habitat within the project area. I have determined that none of the alternatives of this project will have any direct, indirect, or cumulative effects on water howellia.

Keck's checker-mallow is an annual forb, known conclusively only from the Sierra foothills of Tulare and Fresno counties. Some plants collected from Colusa County were tentatively identified as *S. keckii* in 2009, but this is under review and will be determined by genetic testing. The species has never been identified or collected from Mendocino NF lands. I have determined that none of the alternatives of this project will have any direct, indirect, or cumulative effects on Keck's checker-mallow

Biological Evaluation and Survey and Manage Species

The full list of species addressed in this section are listed in the botany specialist report. The two Survey and Manage vascular plant species on the MNF (the orchids *Cypripedium fasciculatum*; clustered lady's-slipper and *Cypripedium montanum*; mountain lady's slipper) are also on the Sensitive list, so they will be addressed together.

Alternative 1: No Action

Under the no action alternative, no project-related ground disturbing activities will take place. This alternative would therefore have no direct effects on Forest Service Sensitive or Survey and Manage plant species.

However, the proposed invasive species treatment would also not occur, or be much reduced to existing manual treatments, and this would likely lead to increased spread and density of invasive species, especially along roads. The one known occurrence of the Sensitive species *Calycadenia micrantha* straddles a road, and it could be negatively impacted by increased competition from invasive species encroaching on the site. There could therefore be some negative indirect effects on Forest Service Sensitive species by implementing the no action alternative.

Alternative 2, 3, and 5: Proposed Action and Alternatives that also include herbicide use

There is one known location of the Sensitive species *Calycadenia micrantha* within proposed reforestation unit #4. The site will be flagged for avoidance, but because it straddles a road and some plants occur right up to the road surface, there is a risk of direct effects to individuals from vehicles and equipment, especially if vehicles drive or park off the main road surface, even if the site is otherwise excluded from ground-disturbing activities. Such actions are likely to affect individuals, but are unlikely to threaten the entire occurrence or cause the species to trend toward federal listing.

Possible negative indirect effects could occur due to invasive treatments in these alternatives. Although any herbicide application would take place at least 25 ft away from any Sensitive species occurrence, drift or runoff of herbicides could cause negative indirect effects to plants, especially near the edges of the site. These indirect effects may affect individuals, but are unlikely to threaten the entire occurrence or cause the species to trend toward federal listing.

Indirect effects may also be beneficial to Sensitive plant species if the proposed invasive species treatments occur. Decreasing the extent and density of invasive plant species increases the habitat available for native plant species, including Sensitive species.

For cumulative effects on Sensitive plant species in the project area, past, current, and reasonably foreseeable future events include past forest management and wildfires, the 2018 Ranch Fire, the Bartlett roadside hazard tree removal project, and other future forest management activities. These actions would add cumulatively to the potential direct and indirect effects of the action alternatives. While there is always a risk of damage to individual plants of a Sensitive species, the effects are not expected to be severe enough to threaten viability or cause species to trend towards federal listing.

Alternative 4: Proposed Action without the use of herbicides

This alternative combines the possibility for direct effects to Sensitive species of action alternatives 2, 3, and 5 with some of the indirect effects of the no action alternative. In summary, possible negative direct effects to the Sensitive species *Calycadenia micrantha* could be due to trampling of roadside plants by vehicles or equipment. Such actions are likely to affect individuals, but are unlikely to threaten the entire occurrence or cause the species to trend toward federal listing.

Under this alternative, the proposed invasive species treatment would not occur, or be much reduced to existing manual treatments, and this would likely lead to increased spread and density of invasive species, especially along roads. The one known occurrence of the Sensitive species *Calycadenia micrantha* straddles a road, and it could be negatively impacted by increased competition from invasive species encroaching on the site. There could therefore be some negative indirect effects on Forest Service Sensitive species by implementing alternative 4. However, this alternative poses no risk of negative indirect effects to sensitive species due to herbicide drift, which is a risk of alternatives 2, 3, and 5.

Invasive Species Risk Assessment

Alternative 1: No Action

Under the no action alternative, neither ground disturbing activities nor proposed invasive species treatments will take place. The absence of equipment use and ground disturbance would decrease the risk of spread and introduction of invasive species, though because most current infestations occur along roads, regular vehicle use of roads represents an existing low background risk. Additionally, under this alternative the proposed invasive species treatments would not occur, so the risk of spread of invasive species is much higher than it would be under the proposed action. The overall invasive species risk for the no action alternative is **moderate**.

Alternative 2, 3, and 5: Proposed Action and Alternatives that also include herbicide use

The equipment used to implement this project will be frequently entering and/or passing through roadside infestations of non-native invasive species. This equipment is likely to expand existing infestations and spread seeds to other portions of the project area. The existence of many weed propagules already within the project area combined with the extensive ground disturbance caused by this project indicates a high risk of expansion and/or spread of existing sites. This risk will be somewhat mitigated by implementing the proposed herbicide treatments, but it is likely that some of the proposed equipment use and ground disturbance will take place before all of the invasive treatments are completed, so the risk is not fully reduced. The overall invasive species risk for these action alternatives is therefore **moderate**.

Alternative 4: Proposed Action without the use of herbicides

This alternative combines the ground disturbance of the proposed action with the lack of invasive species treatment of the no action alternative. As described in the previous section, under the proposed action the equipment used will be frequently entering and/or passing through roadside infestations of non-native invasive species. This equipment is likely to expand existing infestations and spread seeds to non-infested areas/units within of the project area. The existence of many weed propagules already within the project area combined with the extensive ground disturbance that would be caused by this project indicates a high risk of expansion and/or spread of existing sites. In addition, under this alternative, this increased spread of invasive species would not be mitigated by the herbicide treatment proposed in alternatives 2, 3, and 5. Therefore the risk of spread not directly related to project activities is moderate, like that for the no action alternative. The combination of extensive ground disturbance and no herbicide

treatment creates the highest risk of any of the action alternatives proposed for this project. The overall invasive species risk is **high** for this action alternative.

Fuels

Fire Risk

The project location presents a significant risk of wildfire entering the National Forest from the foothill communities of Lucerne, Glen Haven and Clearlake Oaks on the North/Northeastern shoreline of Clear Lake where human caused fire starts are regular during the fire season. (Refer to Figure 8: Fire History Ignition Points).

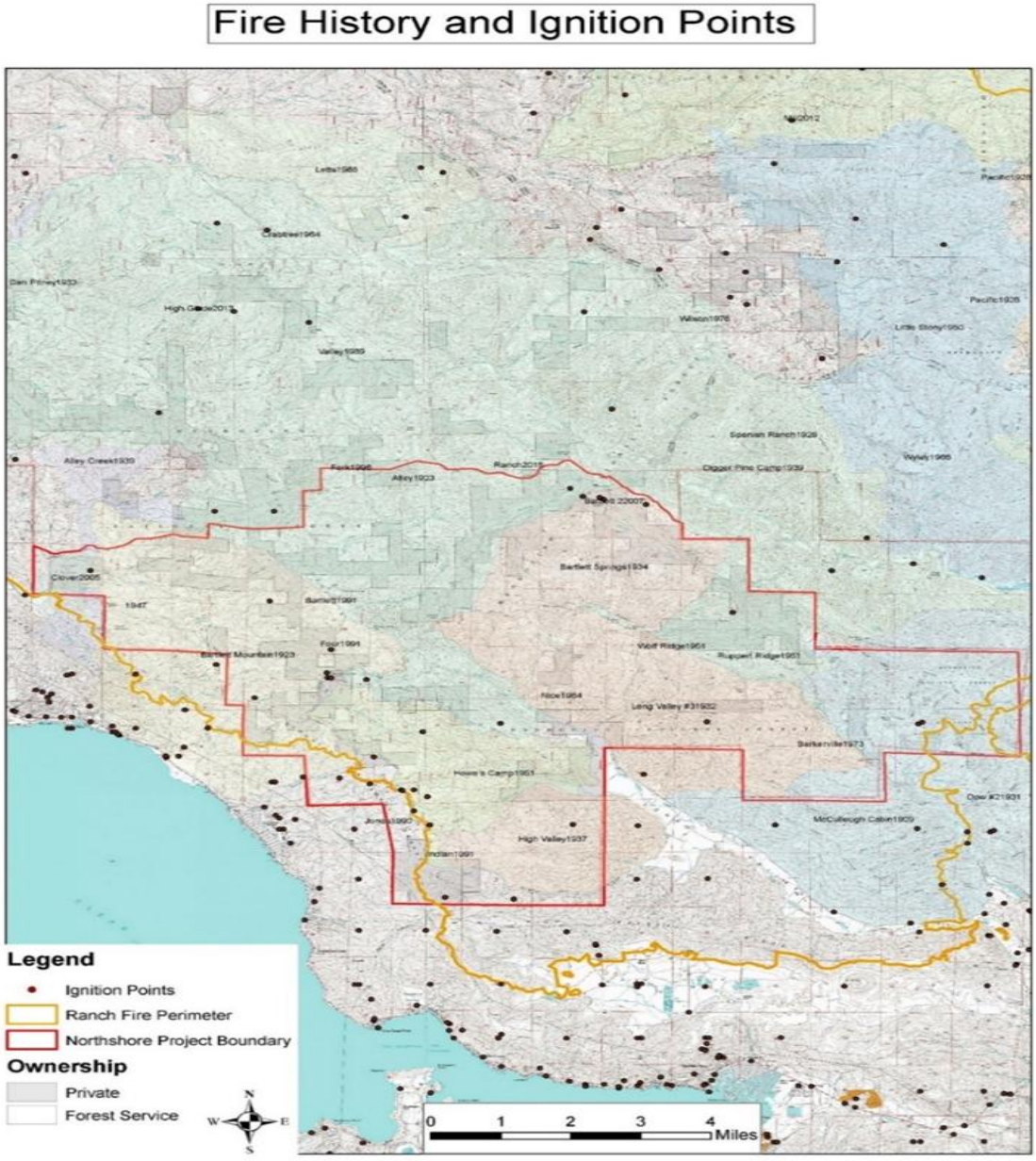


Figure 8. Fire History Ignition Points

Fire History

Fire History Map Figure 2 and Table 6. Large Fire History Within Northshore Project Area, also shows that fire has threatened these communities from several past large wildfires that traveled from the North/ North East through the Forest and towards these communities. Potential ignition risk sources include human causes as well as lightning causes although the latter is less common in within this project area as compared to some areas on the Forest to the North.

Table 6 shows the project area's large fire history records for the project area.

Table 6. Large Fire History Within Northshore Project Area

FIRE NAME	YEAR	CAUSE DESCRIPTION	AGENCY	ACRES BURNED WITHIN PROJECT AREA	TOTAL ACRES FIRE SIZE
Alley	1923	arson	USF	937	1595
Bartlett Mountain	1923	arson	USF	6523	9952
McCullough Cabin	1929	arson	USF	157	1514
Dow #2	1931	arson	USF	4	1229
Long Valley #3	1932		USF	6042	6905
Bartlett Springs	1934	miscellaneous	USF	4288	4316
High Valley	1937	arson	USF	2165	2843
Digger Pine Camp	1939	miscellaneous	USF	68	4012
	1947		CDF	1691	3864
Wolf Ridge	1951	lightning	CDF	879	879
Ruppert Ridge	1951	lightning	CDF	418	418
Howe's Camp	1951	miscellaneous	USF	4864	4864
Barkerville	1973	miscellaneous	USF	8276	26407
Nice	1984	miscellaneous	CDF	478	478
Jones	1990	debris burning	USF	12	19
Indian	1991	debris burning	USF	49	49
Four	1991	debris burning	USF	18	18
Bartlett	1991	debris burning	USF	45	45
Fork	1996	arson	USF	20388	82992
Clover	2005	miscellaneous	CA	516	927
Bartlett 2	2007	miscellaneous	USF	36	36
Ranch	2018			37937	409880
Total Acres				**95790**	**563242**

Environmental Consequences

Project analyses has concluded that a need exists to reduce current and future hazardous fuels in order to maintain and restore wildfire resiliency to the project area. The 2018 Ranch Fire burned much of the project area at extremely high severity causing significant mortality to the various vegetation types. The significant amount of fire killed trees and other vegetation will contribute to future excessive fuel loading. Without active post-fire management, rapid post-wildfire fuel succession (dead woody fuel dynamics) and regeneration of nontree vegetation (shrub and herbaceous) will predispose the recovering early seral forests to future repeated high severity reburns (Coppoletta *et al.* 2016). Therefore, active management is needed to avert high severity reburns, to re-establish pre-fire forest vegetation types (although at a spatial arrangement and density to be more resilient than the pre-fire conditions), and to reduce snag density (biomass) to manage dead woody fuel successional pathways and fuel loadings.

Multiple fire protection objectives have been identified from the existing conditions that center around heavy fuel loading. One objective is the protection of surviving green trees and stands of trees. Others are the protection of wildlife habitat, watersheds and human communities.

The intensity of treatment and level of active management will depend on the specifics of the area being treated. Where conditions allow, fire may be able to play its natural course with little management intervention. In contrast, within the WUI area fire suppression will likely continue to be very hands on, requiring active management with multiple treatments. The range of treatments has a middle ground where terrain and fuel loading are such that light to moderate management treatment maybe applied such as prescribed burning and associated preparation needed to safely and effectively conduct such an operation (feathered treatments). Therefore, to provide for treating the project area in the best way possible, there is a need to have as many tools as possible. Such tools are provided within the LRMP. Fuel reduction treatments may be applied as both mechanical and/or hand treatment including pre-commercial and commercial thinning, mastication, cut-and-pile, and use of prescribed fire including understory burning, chaparral burning and pile burning.

Table 7 compares Alternatives 1, 2 and 5. Alternatives 3 and 4 would be the same as alternative 2 for fuels effects and were not broken out in the table. Table 7 was developed as part of the research project lead by Morris Johnson of the Pacific Northwest Experiment station, the Forest Vegetation Simulator (FVS) and the Fire and Fuels Extension (FFE) of FVS were used to simulate post-fire conditions for the potential buildup of surface fuels over time. Information on fire killed trees as they contribute to down wood was derived from stand exams data collected. FVS is a firmly established tree and stand growth model that is fully supported and maintained by the Forest Service (Dixon 2002).

Table 7: Fuel Load Comparison By Alternatives.

Alternative	Average of all plots taken in Bear Unit: Projections of Surface Fuel Loading in Tons/Acre (10 Year Cycles)								Average of all plots taken in Bear Unit: Percent Surface Fuel Load Reduced (10 Year Cycles)							
	2019	2029	2039	2049	2059	2069	2079	2089	2019	2029	2039	2049	2059	2069	2079	2089
#1 - No Action	12	79	132	137	128	122	110	100	0%	0%	0%	0%	0%	0%	0%	0%
#2 - Proposed Action	3	10	15	16	16	15	15	14	27%	88%	88%	88%	88%	88%	87%	86%
#5 - Retain All Snags >21" DBH	3	34	60	66	68	67	64	60	27%	57%	55%	51%	47%	45%	42%	40%

Alternative	Average of all plots taken in LSR Unit: Projections of Surface Fuel Loading in Tons/Acre (10 Year Cycles)								Average of all plots taken in LSR Unit: Percent Surface Fuel Load Reduced (10 Year Cycles)							
	2019	2029	2039	2049	2059	2069	2079	2089	2019	2029	2039	2049	2059	2069	2079	2089
#1 - No Action	14	97	165	179	174	164	150	137	0%	0%	0%	0%	0%	0%	0%	0%
#2 - Proposed Action	4	10	15	15	15	15	14	14	27%	90%	91%	91%	91%	91%	91%	90%
#5 - Retain All Snags >21" DBH	4	55	98	109	112	111	106	99	27%	43%	40%	39%	35%	32%	30%	28%

Alternative	Average of all plots take in OPPO Unit: Projections of Surface Fuel Loading in Tons/Acre (10 Year Cycles)								Average of all plots taken in OPPO Unit: Percent Surface Fuel Load Reduced (10 Year Cycles)							
	2019	2029	2039	2049	2059	2069	2079	2089	2019	2029	2039	2049	2059	2069	2079	2089
#1 - No Action	12	69	116	124	124	121	117	113	0%	0%	0%	0%	0%	0%	0%	0%
#2 - Proposed Action	3	10	16	16	16	16	15	15	27%	86%	87%	87%	87%	87%	87%	87%
#5 - Retain All Snags >21" DBH	3	50	91	100	102	103	102	100	27%	28%	22%	20%	17%	15%	13%	12%

Alternative 1: No Action Alternative

By definition, direct and indirect effects (40 CFR 1508.8), and cumulative effects (40 CFR 1508.7) result from the proposed action or other action alternatives, and thus are not germane to the no action alternative.

Under Alternative 1, no fuel treatments would be implemented to accomplish the purpose and need. The no-action alternative does not propose active resource management. The intent and the desired condition set forth the LRMP and NWFP would not be achieved, however this does not mean that ecosystems would not change, even in the absence of active management. Fuel loading will progress as shown in Table above.

While no direct, indirect of cumulative effects result from the no action alternative, observed trends in fuel accumulation would likely continue. This trend will result in fuel loading to excessively increase over time. The burned area would continue its natural processes as snags fall and accumulate as surface fuels. The majority of small to mid-sized snags will fall in the next 10 years. Followed by larger trees and tree species that decay slower. Fallen snags will accumulate as surface fuel on the ground. This will cause excessive ground fuel loads and an increasing likelihood of future uncharacteristic large wildfires. The effect of naturally occurring heavy fuel loading becomes the greatest potential concern related to the threat of uncharacteristic future wildfire. Compromising fire suppression in the project area.

High accumulations of downed fuels cause an increase in fire intensity. Unfortunately, the models do not reflect contributions by large woody material or deep forest floor layers to hours-long energy release behind the flame edge or large-scale effects on atmospheric circulations. Atmospheric circulation refers to the ability of wildfires to create their own weather.Stephens point out, a different and dangerous class of fire behaviors emerges at large scales and depends on the combination of high dead surface fuel loads and long burning times extended across a large area. (Stephens et al, 2018). The consequences of this increase in total energy to wildfire behavior cannot be determined by today's operational fire behavior models, which were designed to predict the forward spread rate of thin linear flame zones.

Alternative 2: Proposed Action

Under this alternative, a combination of prescribed fire, salvage logging, fuels thinning, and planting will be utilized to reduce future surface fuel loads and restore the landscape to one that is more resilient to wildfire in general and in a WUI setting.

The following thinning techniques will be used as appropriate on the landscape to meet objectives: hand thinning and mechanical thinning, hand and mechanical piling, and chipping. Burning would include pile burning, jackpot burning, and understory broadcast burning. Spring and Fall burning would allow for meeting LRMP guidelines (LRMP IV-21) for varying prescribed fire intensity, seasonal timing of burns, retention of large woody material, and reducing smoke impacts.

Having the flexibility to burn during different seasons allows for managers to meet objectives of prescribed burns. Details of treatment by type and acreage can be found in appendix A.

Fuels Prescriptions: See Appendix A.

Siviculture Prescriptions: See Silviculture Report or Appendix E of the EA.

Direct Effects

Fuel load accumulation over time for different alternatives can be seen in Table 7. Alternative 2 has the greatest effect on reducing future fuel loads to manageable levels. Reducing fuel loads reduces fire behavior.

Fuel loads in Table 7 for the Proposed Action show fuel loads of 3 to 22 tons per acre levels. Fuel Models TL1 and TL3 can be used to characterize fire behavior of the lower ends of this fuel load range and TL4 and TL5 for the higher range. It's important to note that Fuel Models only predict fire behavior of material 0-3" DBH for spread rate and flame lengths calculations. In the meantime, Brown's recommendation of 5-20 tons per acre of coarse woody debris applies only to material greater than 3" DBH. Both small diameter (0-3") and larger diameter material (>3") affect fire behavior (Brown et al 2003).

Smaller material is considered to have the greatest effect on spread rate and flame lengths in fire behavior fuel models, however it is well known through experience in local wildfires and prescribed fires that larger diameter materials also carry fire and hold intense heat for long periods of time.

Locally, even during prescribed burning operations, large logs catch on fire and have long heat residence time and high flame length. They do not directly contribute as much to spread rates of fires in the way finer fuels do. However, the heat generated contributes to pre-heating of fuels, heating of the cambium layer of trees, and have a great effect on fire behavior and fire effects. By reducing future surface fuel loads, the North Shore project area will be more resilient to wildfire and more easily managed with prescribed fire after the proposed action is implemented.

Further detailed and discussed below are the main treatment types and their direct effects.

Commercial Salvage Operations

Salvage operations can be expected to add to the amount of surface fuels in the treated stands even with the harvest methods that remove a majority of slash from the unit. These changes have the potential to increase fire behavior within the stand if material is not removed. However, the proposed action calls for removing surface fuels after tree removal. The treatment of surface fuels is expected to counteract any increase in potential fire behavior resulting from a changed stand structure, leading to a net reduction of potential fire intensity within treated stands. During the time between tree removal and surface fuel treatments (generally 1-3 years) there may be an increase in the intensity of potential fires within the stand. This increase would be seen eventually with natural tree fall.

Studies of some areas conclude that fire intensities were greater in stands that were exposed to wildfire before surface fuels were treated (Graham et al, 1999, Finney et al 2003). Other studies have found that intensities in such stands were comparable to that of untreated stands (Murphey et al, 2007). A report from the Angora Fire showed commercial thin units (with follow up pile burning) to be very effective at moving crown fire to surface fire (Murphey et al, 2007). Similarly, a report from the Moonlight Fire showed commercial harvest units to have reduced canopy loss as compared to untreated units (but not as much as thinning/burning) (Dailey et al, 2008). A report on the American River Complex showed that treated areas which were not prescribe burned did reduce fire behavior but were still intense enough to kill many overstory trees. However, units that were treated with prescribed burning following commercial thinning treatments reduced the effects of fire behavior even further. A report on the effectiveness of treatments affected by the Cone Fire showed that thinning of stands greatly reduced mortality of trees subjected to the fire and stands that were thinned and followed by prescribed fire showed even greater reduction in mortality (Cone Fire 2007). The Cone Fire was also used in a study of snag longevity and surface fuel accumulations post fire in Ponderosa Pine dominated stands and showed that post fire accumulations of surface fuels in units not salvaged exceeded management ranges recommended by Brown et al (2003) (Ritchie et al, 2012).

Thinning of trees less than and equal to 21" DBH in plantations and naturally forested, previously forested or future planted areas

Direct effects on fire behavior and fuel condition for these treatments are expected to be similar in many regards to those of commercial thinning. Removal of dead trees that will contribute to excessive future surface fuel loading will improve the landscape's resilience to wildfire as well as other disturbances. In green areas and islands that remain after the fire, removal of small trees and brush from the understory of a stand raises the average canopy base height of the stand and lessens the chance that a fire will scorch or burn the canopy of the stand. And treating within a buffer surrounding these areas will help protect what little vegetation survived the Ranch Fire. In some stands within the project area, the removal of some trees in the stand will increase the amount of light and wind reaching the ground. In these stands, the treatment of surface fuels within the stand and reduction in the number of small trees in the stand are expected to result in less intense fires (as discussed above under commercial thinning).

Mechanical fuels treatment

Direct effects on fire behavior and fuel conditions are expected to be similar in many regards to those described for thinning operations. Since these treatments are proposed in areas of dense understory vegetation, where thinning by other methods would be difficult, they are expected to significantly reduce the potential for intense fires within these stands. As with other thinning activities, the full effects of the treatments for reducing undesirable risks from wildfire will not be achieved until all treatments are complete, including prescribed burning.

Planting

Planting trees in strategic areas will help create future forested stands that are easier to manage with prescribed fire in WUI areas, fuel breaks and in buffer areas that are protecting some other area of value as identified during the planning process.

Prescribed burning

This treatment is expected to have several direct effects on treated stands. Burning is expected to reduce the amount of small diameter surface fuel present in treated stands. Burning is expected to kill some portions of understory vegetation within timbered stands and reduce shrub regrowth. This will reduce the potential intensity of wildfires that burn through the area for up to 10-15 years post prescribed burn entry (Keifer et al 2006).

The actual amount of surface fuel or understory vegetation consumed by burning is highly dependent on the conditions at the time of burning. Burning is also expected to kill some larger trees within timbered stands. Mortality is expected to vary with stand structure and conditions at the time of burning but is expected to be less than 10% in trees over 16” DBH. Burning is expected to remove some existing snags and logs from the treated stands. It will also create new snags and logs through overstory mortality (Stephens and Moghaddas, 2005) (Bagne and Others 2008). While some large woody debris is likely to be consumed, at least the minimum of required levels per Best Management Practices will be maintained.

In areas where green trees were left, burning is also expected to raise the average canopy base height of treated stands as these stands regrow.

Chaparral burning would have several direct effects including: 1) reducing wildland fire hazards and 2) moving towards returning diversity in brush seral stages. Diversity in seral stages is beneficial to the wildlife that are dependent on the brush for habitat and food sources. While prescribed burning can be used as a tool to thin small diameter (generally less than 6” dbh) trees, it takes several entries of fire to successfully thin such a stand. The initial burn would kill some of the small diameter trees but those would be left standing dead, which acts as dead ladder fuels.

At least one additional entry of prescribed fire is needed to consume these fuels. Prescribed burning without hand or mechanical thinning first (especially in multi-story, dense areas) is more likely to carry fire into the canopies of the mid-sized and larger trees that are overstory, resulting in higher risk of mortality to the overstory trees than mechanical or hand thinning of these trees.

Due to the expected increase in fuel loadings over years to come, prescribed burning may require multiple entries in order to meet and maintain objectives.

Prescribed burning is often effective in reducing surface fuel loadings to desirable levels as well as to reducing future shrub regrowth in currently, previously or future forested stands. Shrub regrowth in the timbered stands is expected, even desired to a certain extent as habitat and would not pose high risks of fire activity if kept as a minimal component of these stands. There will be many acres of shrub in the project area that would be managed by prescribed burning only. The amount of shrub and forb regrowth that may be expected would pose less of a fire risk than the no-action alternative and would allow natural ignitions to burn through the stand with less torching/crowning and mortality than under the no-action alternative. Even with higher fire return intervals under historical fire regimes, it would have been natural to have some patches of brush and forb growing in timbered stands.

Indirect Effects

For all units, treatments are expected to have a beneficial effect on immediately adjacent, un-treated stands for a short distance. In case studies of the effectiveness of fuel treatments exposed to wildfires, treated units modified the behavior of fires for up to 300' beyond the unit (Murphy et al, 2007). Treatments would decrease fuel loading, continuity, and promote a more fire resilient landscape. Fires are expected to move more slowly and with less intensity through treated units. Studies have shown that treatment units strategically placed within a landscape can slow the growth of large fires (Finney 2001, Finney 2006). While fires are a natural and necessary part of the ecology of this area, post-fire conditions create the potential for reburn fires of greater intensity and size than are normal for the area (as outlined previously in this report) and the ability to suppress or mitigate such fires will be an important part of restoring this area to more ecologically resilient conditions.

Treatments, as proposed, are expected to have the indirect effect of lowering the potential emissions of a summer wildfire (after implementation of treatments) in the project area. This indirect effect is the result of removing some of the fuel in the project area and of making some of the fuel remaining in the stand unavailable to burn. Fuel is removed by removing commercial timber, pre-commercial and understory trees less than 10 inches DBH, and by burning some of the surface fuel in a prescribed fire. Some of the remaining fuel is made unavailable to burn by reducing the chance of tree crowns burning under all but the most extreme conditions.

Cumulative Effects

Several projects have been completed were being implemented within the project area before the Ranch Fire burned. The Lakeview Hazardous Fuels Reduction Project and the High Valley Thinning Project were both within the project area boundary. The Bartlett Hazard Tree removal is also being implemented in the project area.

Treated units in this project that burned at lower severity levels in the Ranch Fire are expected to have an effect on the growth of large fires in the project area that is cumulative with previous and on-going treatment units within as well as adjacent to the project area (projects are listed above). All of these projects combined can be expected

to have a cumulative reduction on the potential size of fires that are large enough to contact more than one treatment (Finney 2001).

Because of the widespread, but short-lived, impacts of emissions from fire, no other projects were considered for this cumulative smoke/emissions impact analysis. Emitted pollutants from fire do have an effect on an area, the size of which depends on atmospheric conditions at the time of the fire. Within this area, pollutants from fires can be cumulative with emissions from many sources, including other fires, vehicles, industrial sources, buildings and agriculture. It is impossible to predict what pollution sources may be present at the time of a fire occurring at some unspecified date in the future.

Road brushing – This activity is routinely carried out by fire crews as part of road maintenance. This is not expected to cause cumulative effects within the project since it is carried out within 5 feet of roadsides and only affects brush and small trees growing within that distance.

Alternative 3: Proposed Action with limited herbicide use

Direct Effects

This alternative would follow actions proposed in Alternative 2 but does not include any use of herbicides except in research plots. There is no change in hazardous fuels effects between alternative 2 and 3 because it is assumed that this work would still be accomplished utilizing other tools.

Indirect Effects

As described under the Indirect Effects section for Alternative 2, treatments are expected to have a beneficial effect on immediately adjacent, un-treated stands for a short distance.

Cumulative Effects

Cumulative effects would remain the same as in Alternative 2.

Alternative 4: Proposed action with no herbicide use

Direct Effects

This alternative would follow actions proposed in Alternative 2 but does not include any use of herbicides. There is no change in hazardous fuels effects between alternative 2 and 4 because it is assumed that this work would still be accomplished utilizing other tools.

Indirect Effects

As described under the Indirect Effects section for Alternative 2, treatments are expected to have a beneficial effect on immediately adjacent, un-treated stands for a short distance.

Cumulative Effects

Cumulative effects would remain the same as in Alternative 2.

Alternative 5: Diameter limit for fire kill or injured trees

Direct Effects

This alternative would follow actions proposed in Alternative 2 except it would retain all standing snags and LWD greater than 21" DBH. As seen in Table 7, fuel loading in this alternative is lower than the no action alterative but still excessively higher than the 5-20 ton per acre (TPA). This excessive fuel load will make future fire suppression difficult, be a threat to values at risk (i.e. WUI, private property, green islands) and the landscape will not be as fire resilient as it would under Alternative 2.

Indirect Effects

Since treatments have an effect on adjacent untreated stands for a short distance (see indirect effect in Alternative 2), there may be a loss of benefit to these stands based on expected fire behavior under this treatment.

As this alternative would not remove as many trees/fuels from these units, there will be more fuel left available to burn during a wildfire. This may cause the potential for a higher level of emission being created during a wildfire.

Cumulative Effects

Cumulative effects would remain the same as in Alternative 2 except that there would be less of a cumulative reduction in potential wildfire size as compared to Alternative 2.

Geology

The North Shore project occurs on Franciscan Assemblage bedrock, which is primarily composed of greywacke sandstones and siltstones. There are some noticeable outcroppings of metabasalt and chert, sometimes towering above the ground.

Geologic resources occur in the project area. There are known invertebrate fossil localities in the remote far southeastern part of the project area. These localities are outside of salvage and reforestation units. There are also known crevice and talus caves in the project area, some within reforestation units. Groundwater is currently elevated due to widespread tree mortality and lack of landscape-wide evapotranspiration.

Elevated groundwater levels along with rapidly deteriorating roots of dead trees and large shrubs means landslides and debris flows are more likely to occur on steep upland slopes and in streams. However, climactically, the project area receives much less average annual precipitation than other parts of the forest. This and lower terrain relief may explain fewer observations of non-road related active landslides and poorly developed inner gorges. No debris flows were observed in the project area during the 2018-2019 winter.

The project area does include a portion of the Bartlett Springs Fault Zone area, in the Bartlett Springs valley, which is a seismically active area with an abundance of ultramafic bedrock such as serpentinite. Most serpentine soils and serpentinite bedrock in the project area occur within the Bartlett Springs Fault Zone, with only very minor occurrences elsewhere such as at Ladder Ridge at the opposite northwestern edge of the project area. Mapped ultramafic bedrock occur only within proposed fuels

treatment areas. Although there are currently no claims and no mining activity, there is evidence of historical asbestos mine activity at Ladder Ridge, but the project area largely excludes that area. The project area is located within the Berryessa Snow Mountain National Monument and it is withdrawn from future mining and energy leasing.

Alternative 1: No Action

The No Action Alternative means that existing environmental trends would continue in areas that the action alternatives would have treated. Adjacent areas would not have beneficial indirect effects of the action alternatives. Trends such as long-term reduction in slope stability where forest regrowth is not rapid or cannot occur – e.g., lack of nearby seed sources, seed bank, or a type-conversion to low lying, shallow rooted herbaceous species. Evapotranspiration, root strength, canopy rain interception would not recover in these areas, thus increasing the risk of new or existing mass wasting. Roads may not receive additional maintenance, possibly increasing the risk of road-related landslides. Slopes may have prolonged sensitivity to unusually wet weather, perhaps resulting in higher than normal frequencies of landslides and debris flows. As groundwater may remain elevated, seeps and springs and wet areas that developed after the fire may persist. Long term elevated groundwater levels may benefit wildlife but may also impact water quality and increase erosion or mass wasting, especially at roads.

Alternative 2: Proposed Action

The Proposed Action includes salvage, reforestation (including site preparation), and release treatments. Proposed release treatments include the option of herbicide application. Use of Geologic Resource Protection Measures and Hydrology Design Features and Best Management Practices, minimizes the likelihood of long-term negative effects on caves, fossils, groundwater, serpentine soils, and slope stability.

For salvage and mechanical site preparation, there may be short term negative effects on slope stability due to heavy equipment altering surface water flow paths. However, effects are expected to be minimal as heavy machinery is generally restricted to slopes less than 35% slopes, and Hydrology's protection measures require ground cover standards. Furthermore, salvage or harvest activities would primarily occur on or around relatively gentle ridges. Harvest activities and heavy equipment are not allowed in unstable areas, including active landslides and inner gorges (streamside slopes greater than 65%). Finally, salvage of dead trees would not impact evapotranspiration or root support as those characteristics are already declining. Site preparation may require removal of live vegetation and that would temporarily reduce ground cover, root support and evapotranspiration until newly planted trees establish vigorous growth.

After salvage activities and site preparation in, trees would be planted in some units. Successful reforestation would reestablish trees, including conifers and oaks, which would in the long-term increase slope stability with greatly increased root support, evapotranspiration, canopy cover, and ground cover. Wherever reforestation occurs, slope stability is expected to increase substantially within 30 years. For reforestation to be successful, release treatments are required.

Herbicide treatments minimize ground disturbance during release . If spilled or applied in a non-label way, herbicide treatments may contaminate surface and groundwater. Geology protection measures exclude treatment within unstable areas, inner gorges,

and caves. Labeled and safe use of herbicides should have no measurable impacts on geologic resources and hazards, including groundwater. When necessary, hand release of planted trees causes ground disturbance but would likely not increase runoff or instability. Relative to mechanical-based site preparation, foot traffic and removal of small vegetation by hand tools to release trees causes soil disturbances that are much smaller, more targeted, more localized, and usually discontinuous.

Most known serpentine areas in the project boundary are on private property. Serpentine areas on NFS lands do not fall within proposed salvage or reforestation units but may be subject to fuels treatments. Resource protection measures prohibit operation of heavy machinery in serpentine soil areas, as well as dragging of vegetative matter through them. This is to protect serpentine soils and, as naturally occurring asbestos are common in serpentine areas, human health.

Fuels activities may occur throughout the project area. Heavy machinery, such as masticators, are not allowed within unstable areas or on slopes steeper than 35%. Fuels treatments are proposed to help reduce the chance of future high intensity wildlfire. Fuels treatments are not expected to cause new or reactivated landsliding. These treatments would have negligible impacts on geologic resources.

Finally, road maintenance will reduce the risk of road-related failures that could impact water quality.

None of the proposed activities would likely physically impact caves or fossils. There are no known fossil localities in mechanical treatment areas. Caves are located in fuels units where mechanical equipment would not likely damage caves. Caves are inaccessible to heavy mechanical equipment. Biology's Limited Operating Periods for bats should restrict nearby mechanical noises.

Alternative 3

This alternative modifies the proposed action by authorizing the use of herbicides only in research plots and for control of invasive species. This restriction would reduce the risk of spills but increase the chance shrubs will outcompete young plantation trees and dominate the landscape. This is a concern because shrubs typically lack the deep roots and higher evapotranspiration capabilities of mature trees and could provide less slope stability than mature trees. Hand release of planted trees would cause ground disturbance but would likely not increase runoff or instability. Relative to mechanical-based site preparation, foot traffic and removal of small vegetation by hand tools to release trees causes soil disturbances that are much smaller, more targeted, more localized, and usually discontinuous.

Alternative 4

Alternative 4 modifies the proposed action by excluding all herbicide use. The effects of Alternative 4 would be nearly the same as Alternative 3 except with no herbicide application, there's no risk of herbicide spillage.

Alternative 5

Alternative 5 modifies the proposed action by retaining all logs and snags greater than 21" DBH. Compared to the proposed action, this may increase long-term fuel loading

while also increasing coarse woody debris in drainages and large woody debris on hillslopes. It is unlikely that there would be any fewer ground disturbances. This alternative would have essentially the same effects as the proposed action though if any new landslides or reactivated dormant landslides occur where logs and snags were retained, there would be that much more CWD and LWD available for stream systems. CWD and LWD can help moderate the impacts of debris flows by slowing debris flows by adding resistance as wood can jam against banks, across narrow gorges, or in-stream features. Slower debris flows may reduce sediment transport distances, depositing sediment closer to debris flow initiation, thereby keeping more sediment in local stream systems. Slower debris flows can also reduce bank erosion and may reduce channel scour and stripping of riparian vegetation. On the other hand, CWD and LWD may impede drainage at road crossings, potentially contributing to fill failures. CWD and LWD can deflect water into banks, causing localized erosion or bank failures.

Heritage

Archaeological Field Methods

The survey strategy for this project employed intensive survey techniques ranging from 15 to 30 meter transect intervals. This intensive level archaeological survey is adequate to locate any heritage resource sites. The archaeological surveys covered in this report were completed by Mendocino National Forest Archaeological staff and a number of seasonal Heritage Enterprise TEAMS archaeological technicians the summer of 2019. The survey methodology was held to the requirements of the *Region 5 Hazardous Fuels Protocol for Non-Intensive Inventory Strategies for Hazardous Fuels and Vegetation Reduction Projects (2018 RPA: Appendix H).* Section 3(d) if the Hazardous Fuels Protocol defines procedures for areas of steep slope. This direction allows for the use of a non-intensive survey strategy to be used on slopes greater than 30%. Intensive level survey was applied to the entirety of the proposed commercial component of the North Shore project that had not been previously surveyed at the intensive level, or were not on slopes in excess of 35%. Much of the proposed Fuels only component of the project was also intensively surveyed. This is to allow the use of ground disturbing activities in the areas identified as being less than 35% slope. Weather and access constraints prevented the entirety of the slopes less than 35% within the project area from being intensively surveyed. Those areas with less than 35% slope that were not surveyed will be left out of the proposed treatments.

Approximately 300 acres of the planned treatment area was intensively surveyed (<30 meter spacing) in the 2019 winter season. An intensive survey utilizing traverses of between five and 30 meter spacing was applied to approx. 100 acres of the non-commercial treatment areas and approx. 190 acres of the commercial treatment areas. These areas were predicted to have the highest archaeological sensitivity, which included: slopes of less than 35%, near water sources, rock outcrops, and in glades. Much of the project area is extremely steep, and the soils are very unstable.

Hydrology

The project encompasses about 15,292 acres of Riparian Reserves (RRs), and 3,871 acres of Streamside Management Zones (SMZs). RRs and SMZs constitute a hierarchy of areas designated to protect water quality, aquatic and riparian habitats. The highest level of

protection occurs within the SMZ, where no ground-based mechanized equipment is allowed to operate except at designated crossings.

Direct, indirect, and cumulative effects of the action alternatives (2 through 5) are fairly similar. It is assumed that these effects would be short term. Detailed information about each alternative can be found in the Proposed Action and Alternatives section of the EA. Additional details on methodology, affected environment and environmental consequences can be found in the Hydrology Report.

Action Alternative indicates that potential for cumulative effects is minimal to moderate.

Alternative 1: No Action

Direct Effects and Indirect Effects

Direct and indirect effects associated with not treating the units would result in slow recruitment of ground cover in areas the experienced high soil burn severity, as well as accumulation of forest material; increasing the potential for another catastrophic fire.

Cumulative Effects

The analysis of No Action Alternative is the same as the existing condition. Analysis of the No Action Alternative indicates that potential for cumulative effects is minimal to moderate.

Alternatives 2 through 5

Direct Effects and Indirect Effects (Summary)

Table 8. Summary of Direct Effects and Indirect Effects

Alternative	Direct and Indirect Effects
2	Temporary effects due to removal of vegetation, slash piling, creation of temporary roads, and burning. Use of heavy equipment may affect soil compaction and erosion.
3	Similar effects as Alt 2 for soil compaction and erosion, but less potential negative effects for water quality because less herbicides would be used.
4	Similar effects as Alt 2 for soil compaction and erosion, but less potential negative effects for water quality because no herbicides would be used.

5	Similar effects of Alt 2, but slightly less disturbance since less trees would be cut. Footprint of the project area, however, would remain the same.

Cumulative Effects

All alternatives proposed as part of this project do not exceed the "Threshold of Concern" when analyzed with the Cumulative Watershed Effects model (with the exception of Upper Wolf Creek). Since there are no differences in the ground disturbance footprint between alternatives 2-5, the results remain the same (for detailed explanation see North Shore Resource Report Hydrology) . The main differences between these alternatives would relate to water chemistry. Cumulative effects of water quality from a chemical standpoint are addressed in the Aquatics report.

Upper Wolf Creek had the highest TOC approach, solely due to the Ranch fire. Thus, fuels treatments have been agreed to start no earlier than 2021 (there are no salvage units in this watershed).

Table 9. Alternative comparison using Threshold of Concern (TOC) and Equivalent Roaded Area (ERA)

HUC7	Alternative	TOC	2019 ERA	2020 ERA	2021 ERA	2025 ERA
Ally	1	8	6.15	3.82	1.48	0.98
	2-5			3.86	1.48	0.98
Gilbert	1	8	7.6	5.09	2.65	1.2
	2-5			6.93	5.37	1.27
Nice-Clear Lake	1	8	2.64	2.3	1.97	1.92
	2-5			3.89	2.83	2.14
Lucerne- Clear Lake	1	8	2.23	2.22	2.21	2.21
	2-5			3.05	3.13	2.47
Upper Long Valley	1	11.5	8.84	5.83	2.81	1.17
	2-5			9.69	7.94	2.52
Middle Long Valley	1	12	5.06	2.91	0.75	0.54
	2-5			3.72	2.05	0.54
Lower Wolf Creek	1	8	4.44	2.58	0.72	0.32
	2-5			3.47	2.15	0.32
Upper Wolf Creek	1	7.99	11.6	7.84	4.08	0.81
	2-5			7.84	4.08	0.81
Long Canyon	1	8	6.69	4.16	1.62	0.32
	2-5			4.85	2.72	0.32
Kattenburg Canyon	1	8	0.53	0.31	0.09	0.08
	2-5			0.38	0.15	0.08
Upper Bartlett	1	12	10.79	6.98	3.26	0.99
	2-5			9.58	7.35	1.09
Lower Bartlett	1	12	10.78	7.25	3.78	1.57
	2-5			9.12	6.75	1.63
Hospital	1	8	4.75	2.65	0.55	0.33
	2-5			2.66	0.56	0.33
Twin Valley	1	8	7.95	5.01	2.06	1.31
	2-5			5.06	2.15	1.31

Summary of Effects

The effects resulted from all alternatives proposed in this project do not exceed the Threshold of Concern with the exception of Upper Wolf Creek. Alternative 1 has the

least cumulative effects, but is the most susceptible to catastrophic wildfires in the future. It may be slow to recover and recruit ground cover in areas that burned with high intensity. Alternatives 3 and 4 may have potentially less effects to water quality from the reduced use of herbicides. Alternative 2 would have the most cumulative effects, but will have the most impact in reduction of fuels and recovery of watershed. Design Features, or mitigation measures, applicable to the project would help mitigate any potential effects due to project implementation. These are described in Appendix B of the Hydrology Report and are also found in Appendix B of the EA.

Silviculture

Vegetation

Bioregion: The project area is located within the southern portion *mid montane ecological zone* of the Klamath bioregion*,* an area of diverse conifer and woodland species. Historic vegetation community dynamics within the mid- to upper-montane zone are believed to have been influenced by a fire regime characterized by fairly frequent low and mixed severity fires that created an open understory mixed conifer forest habitat across the project landscape. (Skinner et al. 2006)

Plant Community Classification and Identification: Plant communities associated with the project are classified according to structure type, (tree, shrub, or herbaceous) and dominance of taxa. A plant community is a recognizable and complex assemblage of plant species which interact with each other as well as with the elements of their environment and is distinct from adjacent assemblages. There are a number of common sub-classifications of plant communities these sub-classifications include, forest, chaparral, riparian, and grassland, etc., which are further divided into more specific classifications. These more specific classifications are referred to as vegetation types. They are based on the dominant tree, shrub, or herb in that canopy. The name given to each is often the common name of the dominant and co-dominant taxa coupled with the sub-classification type. Examples of these within the project area are Sierra Mixed Conifer, Chamise-Redshank Chaparral, Closed-Cone Pine-Cypress (Knobcone Pine), and Annual or Perennial Grassland.

Vegetation Types: The Project area contained a variety of vegetation types. The California Wildlife Habitat Relationship (CWHR) system identified eighteen different vegetation types. These types where present in varying concentration from grassland, pure chaparral stands to a combination of chaparral – hardwood, conifer – hardwood, or mixed conifer associations Most of the acreage in the project area burned under hot, windy conditions creating a mosaic of live and dead vegetation. The mosaic features higher severity areas where nearly all vegetation is dead and lower severity areas where a mixture of dead and live vegetation is present. Also, within the mosaic green islands are present. (Refer to Table 10 for CWHR vegetation type code. Refer to Table 11-15 for information concerning vegetation types and fire severity.)

Table 10: CWHR Vegetation types and Corresponding Three Letter Type Code

CWHR* TYPE CODE	Vegetation Type
BOP	Blue Oak-Foothill Pine
BOW	Blue Oak Woodland
COW	Coastal Oak Woodland
CPC	Closed-Cone Pine-Cypress
DFR	Douglas Fir
MHC	Montane Hardwood-Conifer
MHW	Montane Hardwood
PPN	Ponderosa Pine
SMC	Sierran Mixed Conifer
VOW	Valley Oak Woodland
AGS	Annual Grass
CRC	Chamise-Redshank Chaparral
MCH	Mixed Chaparral
MCP	Montane Chaparral
MRI	Montane Riparian
PAS	Pasture
WTM	Wet Meadow

*California Wildlife Habitat Relationship

Table 11 represents the dominant conifer project area burn severity classes expressed in percent basal area loss within the dominate conifer vegetation types. The species that make up these vegetation types release seed once the cones mature. These species evolved under fire regimes dominated by low- to moderate-severity wildfires. They are poorly adapted to regenerate in large patches of high-severity fire because they are not sprouting species. They reproduce only from seed. Their seed banks are short lived and are substantially depleted by fire.

Table 11: Dominant Conifer Vegetation Type

Burn Severity Classes	Percent Burn Severity Area by CWHR* Vegetation Cover Types Dominant Conifer Vegetation Type						Total	Total Percent Basal
	DFR		PPN		SMC			
	Acres	Area %	Acres	Area %	Acres	Area %	Total Acres	Area Loss
No Loss 0%	0	0%	67	5%	73	3%	140	3%
Low 0-24%	56	8%	153	11%	175	8%	384	9%
Mixed 25-49%	110	15%	282	20%	334	15%	726	17%
High 50-74%	116	16%	269	19%	348	16%	733	17%
Very High 75-100%	440	61%	665	46%	1246	57%	2351	54%
Grand Total	722		1436		2176		4334	

*California Wildlife Habitat Relationship

Figure 9: Cruise Plot #6 2010

Figure 10: Cruise Plot #6 2019

Figure 9 photo was taken in 2010 at a plot center located by GPS as part of the information developed for the Lakeview Hazardous Fuels Reduction Project. Burn char on trees, large diameter trees on ground and the associated smaller diameter CWD are all results of the 1996 Fork Fire. No salvage operations were conducted post Fork fire at this location resulting in the heavy fuel loading. Fuel treatments, as part of the Lakeview project, were planned to reduce the fuel load, but not implemented. Figure 10 is taken from the same plot center post Ranch fire. The fuel loading contributed to the very high intensity fire that killed all trees visible in the picture and consumed all surface fuel, duff layer and leaving bare soil conditions. Surface debris currently visible on ground is from Ranch fire killed trees.

Knobcone Pine

Closed-Cone-Pine Vegetation Type major species is knobcone pine. Knobcone pine is a strongly serotinous species which means they require the heat of fire to release their seeds. They regenerate successfully in large patches of high-severity fire.

Knobcone pine reproduces only from seed (Rielly et al, 2019). This species is commonly associated with a developmental pathway characterized by establishment at high densities following stand-replacing fire (Keeley et al., 1999). In the absence of subsequent fires, longer-lived, more shade-tolerant species eventually replace Knobcone pine as individual trees senesce and die (Vogl, 1973; Zedler et al., 1983; Fry et al., 2012). Knobcone pine may be found in pure stands following high-severity fire or in mixed stands with many other longer-lived conifer and hardwood species. Knobcone pine structural strength weakens quickly resulting in a short snag retention period.

Table 12 represents the project area burn severity classes expressed in percent basal area loss within the closed-cone-pine vegetation type. The dominant species present is knobcone pine.

Table 12: Closed-Cone-Pine Vegetation Type (Knobcone Pine).

Burn Severity Classes	Percent Burn Severity Area by California Wildlife Habitat Relationship Vegetation Cover Types			
	Closed-Cone-Pine-Cypress Forest Vegetation Types			
	CPC			Total Percent Basal
	Acres	Area %	Total Acres	Area Loss
No Loss 0%	36	1%	36	1%
Low 0-24%	18	1%	18	1%
Mixed 25-49%	60	2%	60	2%
High 50-74%	121	4%	121	4%
Very High 75-100%	2612	92%	2612	92%
Grand Total	2847		2847	

Figure 11: Knobcone foreground, middle ground shrub cover, background knobcone.

Knobcone pine may also be found interspersed with and along the border of chaparral vegetation (Figure 11 and 12). As a result of the Ranch fire, the existing conditions are being influenced by the expansion of knobcone seedling into the bordering fire killed

chaparral vegetation areas.

Figure 12: Fire-killed knobcone mixed with black oak sprouts and knobcone seedlings

Hardwoods

Table 13 shows the project area by burn severity classes within the Hardwood Forest Vegetation.

Table 13. Hardwood Forest Vegetation Types

Burn Severity Classes	Percent Burn Severity Area by California Wildlife Habitat Relationship Vegetation Cover Types													Total
	Hardwood Forest Vegetation Types													Percent
	BOP		BOW		COW		MHC		MHW		VOW			Basal
	Acres	Area %	Acres	Area %	Acres	Area %	Acres	Area %	Acres	Area %	Acres	Area %	Total Acres	Area Loss
No Loss 0%	59	13%	25	10%	5	10%	113	3%	385	5%	2	1%	589	4%
Low 0-24%	16	3%	2	1%	0	0%	238	7%	437	6%	26	8%	719	5%
Mixed 25-49%	44	9%	33	13%	4	8%	473	14%	782	11%	75	24%	1411	10%
High 50-74%	54	12%	69	27%	8	17%	513	15%	956	13%	83	27%	1683	12%
Very High 75-100%	293	63%	124	49%	31	65%	1983	60%	4734	65%	127	41%	7292	50%
Grand Total	466		253		48		3320		7294		313		11694	

Grassland and shrubland

Table 14 shows the project area by burn severity classes within the grassland and shrubland Vegetation Types. (Note: The following table is based on canopy cover loss.)

Table 14. Grassland and Shrubland Vegetation Types.

Burn Severity Classes	Percent Burn Severity Area by Forest Vegetation Cover Types											Total
												Percent
	Grassland and shrubland Vegetation Types											Canopy
	AGS	%CC Loss	CRC	%CC Loss	MCH	%CC Loss	MCP	%CC Loss	URB	%CC Loss	Total Acres	Cover Loss
No Loss 0%	168	11%	328	7%	816	6%	37	2%	11	8.59%	1360	6%
Low 0-25%	139	9%	48	1%	422	3%	33	2%	2	1.56%	645	3%
Mixed 25-49%	133	8%	43	1%	350	2%	39	2%	9	7.03%	574	3%
High 50-74%	163	10%	55	1%	413	3%	45	3%	18	14.06%	695	3%
Very High 75-100%	980	62%	4420	90%	12239	86%	1465	90%	88	68.75%	19192	86%
Grand Total	1583		4895		14240		1619		128		22466	100%

Environmental Consequences

Alternative 1: No Action

By definition, direct and indirect effects (40 CFR 1508.8), and cumulative effects (40 CFR 1508.7) result from the proposed action, and thus are not germane to the no action alternative.

Under Alternative 1, no fuel treatments would be implemented to accomplish the purpose and need. The no-action alternative does not propose active resource management. The intent and the desired condition set forth the LRMP and NWFP would not be achieved, however this does not mean that ecosystems would not change, even in the absence of active management. Fuel loading will progress as shown in Table 16 and 17 below.

Alternative 2: Proposed Action

Direct Effects

Fire Killed or Injured Tree Removal

The direct effects of reducing numbers of fire-killed trees are associated with the reduction in future fuel loads, and reduction of safety risks to the public, adjacent property owners or Forest Service or contracted personnel who work in this high use areas.

Removal of the fire killed trees will enable site preparation and planting operations to take place. The effect of not removing the fire killed trees will result in excessive fuel loading leading to site conditions that prohibit implementation of reforestation operations. Refer to Table 15.

Table 15. Direct Effects on Vegetation and Mitigation of Adverse Effects Occurring in the Near-Term.

Treatment	Vegetation Effects	Beneficial or Adverse?	Mitigation of Adverse Effects
Salvage Harvesting	Lower Fuel Loads	Beneficial /Adverse[1]	Snag and CWD retention guidelines, Fire marking guidelines, no equipment in stream management zones (SMZ).
	Establishes standards for Coarse woody debris (CWD) and snag recruitment		
	Reduce potential fuel loading from fire killed trees		
	Reduced health risk to residual trees		
	Fewer Snags		
	Reduced Hazard Trees		
Site Preparation	Fuel reduction /competition control	Beneficial /Adverse[2]	Avoid areas with natural regeneration, follow compaction mitigation measures in Hydrology Report

[1] Fewer snags are both beneficial and adverse. Fewer snags would reduce fuels and allow for reforestation efforts. However it also can reduce site quality, future down wood recruitment, and wildlife habitat.

[2] Site preparation will benefit reforestation efforts by making sites easier for crews to plant as well as controlling competition. Adverse effects include compaction and damage to natural regeneration.

Treatment	Vegetation Effects	Beneficial or Adverse?	Mitigation of Adverse Effects
Reforestation	Establishes seedling in areas which lack a conifer or hardwood seed source. Accelerated growth of planted seedlings or natural regeneration of major forest species	Beneficial /Adverse[3]	Release and Thinning Treatments

Tables 16, 17, 18 and 19 were developed from data collected as part of the research project lead by Morris Johnson of the Pacific Northwest Experiment station. The Forest Vegetation Simulator (FVS) and the Fire and Fuels Extension (FFE) of FVS were used to simulate post-fire conditions for the potential buildup of surface fuels over time.

The North Shore Restoration Project proposal would result in 592 acres of salvage harvest operations, all within the designated Wildland-Urban Interface. The duration of that harvest should be completed within 3 years of the fire event. The harvest would produce a spike in fuel loading across the immediate area effected by the harvest, most of which due to broken branch wood in transporting logs to the processing deck. Due to decomposition, the increase in fuel loading versus not logging, reaches an equilibrium duration between seven to ten years. (See Tables 1 and 15 Some tops and branches may deliberately be left on site due to needs for duff recruitment, in which case those sites may see a longer duration of increased fuel loading until that material breaks down to duff. After the initial increase, the areas affected by harvest have a net result (sum of all fuel size classes) less fuel loading due to harvest versus not harvesting. Not harvesting continues to build excessive fuel loads for 30 years before starting a gradual decline.

Table 16. Comparing the Proposed Action and No Action alternative current and future fuel loading in tons/acre.

	Average of all plots taken in Bear Unit							
	Projections of Surface Fuel Loading in Tons/Acre (10 Year Cycles)							
Alternative	**2019**	**2029**	**2039**	**2049**	**2059**	**2069**	**2079**	**2089**
No Action	12	79	132	137	128	122	110	100
Proposed Action	3	10	15	16	16	15	15	14

Table 17. Comparing the Proposed Action and No Action alternative current and future fuel loading by percent reduced.

	Average of all plots taken in Bear Unit							
	Percent Surface Fuel Load Reduced (10 Year Cycles)							
Alternative	**2019**	**2029**	**2039**	**2049**	**2059**	**2069**	**2079**	**2089**
No Action	0%	0%	0%	0%	0%	0%	0%	0%
Proposed Action	27%	88%	88%	88%	88%	88%	87%	86%

[3] Reforesting sites is beneficial, however can lead to future fuels hazards. This will be mitigated through future release, thinning and prescribe fire activities.

Refer to Section 18.0 Appendix B in the Silviculture report: An Analysis of Fuel Loading and Subsequent Fire Hazard in Post-Fire Salvage Operation Supported By Review of Scientific Information.

Reforestation

Reforestation would take place on approximately 1617 acres of conifer forestland where plantations were established in the past, on areas covered by the Bartlett Hazard Tree Abatement CE (485 acres,) and within the NSRP areas proposed for salvage logging (592 acres). In addition, reforestation may take place in other areas where conifer or hardwood tree removal will be accomplished by other fuel reduction treatments. These areas will be assessed following fuels treatment for regeneration needs and appropriate mitigation measure.

The effect of reforestation with a cluster planting configuration will serve to help develop a random distribution of trees and create spatial heterogeneity (Refer to Appendix E). Historically, western mixed-conifer forested landscapes develop a stand structure as a result of natural mixed-severity fire regimes with large individual trees, tree groups of varying sizes, and intervening gaps [Larson & Churchill (2012), Reynolds et al (2013)]. Recent articles (North et al, 2019) conclude that traditional planting in a high density grid like pattern fails to produce both the spatial pattern that recent research has suggested is associated with greater fire and drought resilience, and the diversified structure that is optimal for wildlife habitat and species diversity (Larson and Churchill, 2012). The proposed cluster pattern at low trees per acre density compared to traditional numbers of trees per acre leaves room for openings to develop, and room for occupation by shrubs and other forms of vegetation. Depending on how successful the planted trees survive there is a possibility that the stand will develop with individual trees, tree groups of varying sizes, and intervening gaps.

This stand structure is referred by (North et al) as individual trees (I), clumps (C), and openings (O), or as an acronym ICO. Developing this ICO structure deviates from the traditional approach of full site occupancy by conifer species, but does not alleviate the need for follow up treatments. When planted trees are more widely spaced, drought stress can be exacerbated by the rapid growth of shrubs and grasses in the high-light environment between trees and increase competition for nutrients and soil moisture, (Lanini and Radosevich, 1986; Riegel et al., 1992; McDonald and Fiddler, 2010; Bohlman et al., 2016). Competing vegetation will require some form of manual, mechanical, or herbicide reduction.

Removing competing vegetation directly around seedlings reduces competition for water to the seedling and allows the trees to grow deeper roots than the surrounding herbaceous competition, thereby improving survival rates and growth of the seedlings. Areas treated with herbicides are expected to have lower shrub densities for at least 10 years. This will improve the success and speed of reforestation efforts. Over the short term, plant abundance may be affected by herbicide treatments, but no plant species would be expected to be eliminated from release treatments. Sites with reduced shrubs may have increased plant diversity and species richness compared to stands that are left untreated. Battles et al. (2001) found that at the Blodgett Research Station in Georgetown, California, understory species richness was significantly greater in managed plantations than in less intensive treatment types. In mixed forests in Canada,

Sutton (1993) found no detectable effect on species composition 10 years after herbicide treatments. DiTomaso et al. (1997) in northern California found no long-term detrimental effect on vegetative cover or species evenness with herbicide use. Trees are expected to grow faster, with the most notable increase evident is in diameter and height growth (McDonald & Fiddler, 2010) in areas treated with herbicide to reduce shrub cover. The effect is a decreasing of time needed to reach a height and structure where seedlings have an increased ability to withstand low intensity fire. Resulting in the effect of increased management options including mechanical treatments and prescribed fire as a management/maintenance tool sooner.

Indirect Effects

The proposed actions will allow sites to progress towards developing future forestland within the areas of very high severity fire, and protect moderate to low severity fire areas given the area's wildfire disturbance history. The action is planned to accelerate development of subsequent stands, develop coarse woody debris, and to bridge to the extent possible maintenance of existing structural wildlife habitat until future stand conditions are able to provide natural structural habitat development.

Salvage harvesting along with subsequent site preparation and reforestation treatments will facilitate the growth and development of these stands towards forested habitat conditions. The treatments in Matrix areas will capture economic value as well as meet objectives for wildlife and other uses while reestablishing productive timber stands back on these sites.

Another effect of hazard tree reduction is increased user and employee safety. Safety will be met through a reduction in the number of current and potential future hazard trees either felled or felled and removed from the project area

Alternative 3 (Limited Herbicides) and 4 (No Herbicide use)

Direct Effects

Under these alternatives, herbicide use for release treatments will be limited to research plots or not applied anywhere. The direct effects from these alternatives when applied to the reforestation treatments area are the same. Therefore, the effects analysis is as presented below:

- Seedling survival is expected to be significantly less with the limited brush control provided by hand or mechanical release treatment only.
- Trees are expected to grow faster in areas treated with herbicide to reduce shrub cover and areas, with the most notable increase evident in diameter growth.
- Hand or mechanical release increases cost of release substantially while reducing effectiveness. Grubbing can cost about $250 per acre and is effective if vegetation is mostly grass and forbs or if shrubs are very young (ie. first year). After the 1st year, costs for treatment can go up to as much as $1200 per acre for a single entry depending on shrub size. With repeated entries, total costs can result in multiple thousands of dollars per acre for treatments that are labor intensive, time consuming and short-lived.

- Longevity of grubbing treatments is expected to be less than 1 season. As vegetation grows back additional grubbing treatments may be needed to maintain seedling health and vigor.
- Without adequate shrub control assisted by herbicides, prescribed fire will be difficult if not impossible to use as a fuel reduction tool.

Indirect Effects

Over time, brush is expected to dominate most areas leaving planted seedlings highly susceptible to loss from wildfire various seedling diseases and limit future management options for use of prescribed fire and mechanical treatments.

- Scientific literature shows that with manual released only trees have substantially less diameter and height growth for decades (Barrett, 1982).
- Without adequate shrub control assisted by herbicides, shrub densities will lead to increased moisture stress for seedlings
- Prescribed fire will be difficult if not impossible to use as a fuel reduction tool.
- Lack of herbicide use has the potential to hinder the ability of maintaining acceptable mortality levels for decades into the future.

Alternative 5: Diameter Limit for fire killed or injured trees

Direct Effects

Tables 18 and 19 were developed from data collected as part of the research project lead by Morris Johnson of the Pacific Northwest Experiment station. The Forest Vegetation Simulator (FVS) and the Fire and Fuels Extension (FFE) of FVS were used to simulate post-fire conditions for the potential buildup of surface fuels over time.

Table 18. Comparing the Proposed Action and Alternatives 5 current and future fuel loading in tons/acre.

Alternative	Average of all plots taken in LSR Unit							
	Projections of Surface Fuel Loading in Tons/Acre (10 Year Cycles)							
	2019	2029	2039	2049	2059	2069	2079	2089
No Action	14	97	165	179	174	164	150	137
Proposed Action	4	10	15	15	15	15	14	14
Alternative 5	4	55	98	109	112	111	106	99

Table 19. Comparing the Proposed Action and Alternative 5 current and future fuel loading by percent reduced.

Alternative	Average of all plots taken in LSR Unit							
	Percent Surface Fuel Load Reduced (10 Year Cycles)							
	2019	2029	2039	2049	2059	2069	2079	2089
No Action	0%	0%	0%	0%	0%	0%	0%	0%
Proposed Action	27%	90%	91%	91%	91%	91%	91%	90%
Alternative 5	27%	43%	40%	39%	35%	32%	30%	28%

While the immediate direct effects of the initial treatments have identical results, 10 years out the reduction in fuel load is substantially less from Alternative 5, and the fuel load is way out of alinement with CWD tons per acre necessary to maintain wildlife needs (Refer to Wildlife Report). In addition, the standing trees remaining after initial treatment by selecting Alternative 5 is 47% greater than the Proposed Action. This difference will have a direct effect of not reducing the overall hazardous conditions attributed to the higher numbers of fire killed trees remaining. Resulting in unsafe conditions for tree planting as related to worker safety during reforestation efforts.

Indirect Effects

The indirect effects as shown in the tables are the continued high numbers of fuel loading tons per acre caused by selecting Alternative 5 into the future. Without adequate reduction in fuel loading prescribed fire will be difficult if not impossible to use as a fuel reduction tool. (Refer to Fire and Fuels Report.)

Soils

Soils in the project area have mainly developed from marine sediments. The mountain landscape of the area led to soils forming on the following landforms ridges, structural benches, and mountain side slopes. Soils in this project area are range from moderately deep (24 to 40 inches) gravelly to very gravelly loams and silty loams. Found in pockets throughout the project area are soils developed from serpentinized peridotite. These soils are moderately deep, to deep gravelly, to extremely gravelly loams and silty loams with moderate soil productivity.

For the purposes of this analysis, it was assumed that the activities proposed in the North Shore Project which are comparable with projects developed on the Klamath National Forest soil disturbance would be similar. Therefore, results from soil disturbance monitoring on the Klamath National Forest are applicable to the Mendocino National Forest (USDA 2012). The Klamath National Forest soils disturbance monitoring report was developed using the National Forest Soil Disturbance Monitoring Protocol (USDA 2009).

Three indicators were chosen that best address relevant issues in the project and measure compliance: soil stability, soil organic matter, and soil structure.

Soil quality standards measured by the analysis indicators are should be met on at least 85% of the acres within proposed treatment units. The threshold of concern for not meeting Forest Plan direction relating to soil productivity would be if 15% or more of a

unit is not meeting desired conditions for the three soils analysis indicators combined. (Refer to Table 20.)

Table 20 below displays the estimated acres not meeting desired conditions for the soils analysis indicators by treatment activity. These values would be the same for alternatives 2 through 4 because acres of proposed ground disturbing activities remain the same. Alternative 5 would have less acres of ground disturbing activities. Since results for alternatives 2 through 4 are “worst case scenario” and fall well below threshold, analysis was not run separately for alternative 5. The column described as Acres Not Meeting Desired Conditions are acres for the entire project area.

Table 20: Estimated acres not meeting desired conditions for soil indicators and activity.

Activity		Proposed Ground Disturbing Activities
	Estimated Percent Not Meeting Desired Conditions for the North Shore Project, Determined from Disturbance Monitoring on the KNF	Acres Not Meeting Desired Conditions (Estimated)
Ground Based Tractor Logging		
Soil Stability	5%	24
Soil Organic Matter	10%	48
Soil Structure	5%	24
Skyline Logging		
Soil Stability	3%	4
Soil Organic Matter	4%	5
Soil Structure	0%	0
Manual Thinning		
Soil Stability	0%	0
Soil Organic Matter	0%	0
Soil Structure	0%	0
Mastication		
Soil Stability	5%	634
Soil Organic Matter	5%	634
Soil Structure	0%	0
Prescribed Fire		
Soil Stability	0%	0
Soil Organic Matter	0%	0
Soil Structure	0%	0

Re-opened Roads on Existing Roadbeds and Landings		
Soil Stability	5%	3
Soil Organic Matter	100%	48
Soil Structure	100%	48
Total Acres of the Project Area Not Meeting Desired Conditions		
	Soil Stability	665
	Soil Organic Matter	735
	Soil Structure	72
Total Percent Acres of the Project Area Not Meeting Desired Conditions (Forest Plan Threshold is 15%)		
	Soil Stability	1.5%
	Soil Organic Matter	2%
	Soil Structure	0.1%

Alternative 1: No Action

Direct and indirect effects (40 CFR 1508.8), and cumulative effects (40 CFR 1508.7) result from the proposed action, and thus are not germane to the no action alternative.

Under Alternative 1, no fuel treatments would be implemented to accomplish the purpose and need. The no-action alternative does not propose active resource management. The intent and the desired condition set forth the LRMP and NWFP would not be achieved, however this does not mean that ecosystems would not change, even in the absence of active management. Fuel loading will progress as shown in Table 16 and 17 of the Silvicultural section above with the potential to increase fire hazard and impacts to soil structure.

Alternatives 2 through 5

Ground-based tractor logging

Ground based tractor logging, with associated landings and skid trails, has the potential to reduce levels of soil cover, affect soil compaction and to displace soil. The combination of increased compaction, reduced soil cover, and soil displacement have the potential to adversely impact the soil resource.

Soil cover

Mitigation measures have been developed as project design features to require retaining minimum levels of soil cover and require cover levels to be met before the rainy season. The amount of soil cover in non-skid trail areas would act as sediment filters and prevent skid trail derived sediment from reaching a drainage channel. Design features that protect course woody debris would ensure these features would continue to provide soil cover into the future.

Soil Displacement and Stability

Project design feature that prescribes placement of waterbars on skid trails and erosion control on landings would control runoff and limit water born soil displacement. Project design features restrict operating ground-based logging equipment to slopes up to 35 percent, which minimize the need for skid trail construction as equipment can usually travel over the surface of the ground reducing the potential for soil displacement. Best management practice (BMP) monitoring of skid trails and landings show that water bars and erosion control measures are effective in controlling erosion and preventing sediment from reaching a stream course (USDA 2011).

Monitoring data from previous projects with similar amount of ground disturbance from ground-based tractor logging units, indicates that 95 percent of the units should meet desired conditions for soil stability following project implementation. There are no conditions found in the project area that would indicate a deviation from the monitoring data.

Soil Compaction and Structure:

Ground-based equipment affects soil compaction on landings and primary skid trails, but with proper layout, the level of disturbance can be kept below levels that would affect soil porosity, permeability and conifer production. Placing a high priority on reusing existing skid trails would help to ensure that the area occupied by skid trails can be minimized. Soil compaction leading to poor soil strength and structure would occur on the heavily used portions of primary skid trails and landings. On skid trails where machinery makes one or two passes, compaction increases only slightly; rooting environment and infiltration are not negatively affected.

Project design features put limitations on the use of ground based equipment during wet weather and saturated soil conditions reducing the amount of compaction on skid trails.

Monitoring from previous projects with ground-based tractor logging units indicates that 95 percent of the units would meet desired conditions for soil structure following completion of treatment activities. There were not any conditions found in the project area that would indicate a deviation from the monitoring data

The effects of soil compaction on conifer production over a 20 year study (Busse, Matt D.; Fiddler, Gary O.; Shestak, Carol J 2017) show that the soil was still affected after 20 years but it did not significantly affect conifer root production. Disturbance monitoring in relation to compaction was performed on the Klamath and is summarized in the “Effects of Ground-Based harvesting on Soil Disturbance, Bulk Density and Total Porosity on the Klamath National Forest” (Laurent 2007). Soil Ground based logging disturbance is expected to produce similar conditions on the Mendocino National Forest as the Klamath National forest, because of soil similarities.

Machine piling could be used to treat activity generated fuels in ground based tractor logged units. Reducing activity generated surface fuel loading with machine piling would result in lower temperatures and shorter residence time of prescribed fire which would benefit soil micro-organisms and plant roots. The disturbance to the soil from machine piling is not expected to disturb any additional acres than the ground based logging activities.

Skyline logging

Skyline cable logging would result in small amounts of soil displacement in the yarding corridors from the tail end of the log dragging on the soil surface. This log dragging usually does not occur over the entire corridor length. The cable corridor can vary from 6 to 8 feet wide and would have an area in the center of the corridor that is down cut 9 to 12 inches deep (based upon past field observations and best management practice monitoring). When properly water barred, no significant soil displacement would leave the harvest units. Soil compaction and reduced soil porosity would be minimal to none.

Monitoring of previous projects with cable logging units indicates that desired conditions for soil stability, soil organic matter, and soil structure are met following completion of treatment activities. There were not any conditions found in the project area that would indicate a deviation from the monitoring data.

Manual Thinning

Manual thinning would not add to the existing disturbance to soils indicators nor would it add to the disturbance caused by other proposed treatment activities.

Mastication

Mastication is a mechanical fuel treatment that changes the structure and size of fuels. Vegetation is chopped, ground, or chipped and the resulting material is left on the soil surface. Machine mastication should maintain the high levels of existing cover by cutting the existing live and dead standing material into smaller pieces and letting it fall to the soil surface. Machine mastication would have a slight impact to soil organic matter because fine surface fuels would be increased with minimal disturbance to the topsoil. Slight increases in compaction would occur in travel access corridors around the unit. Machine traveling over masticated materials reduces the potential for soil compaction.

Monitoring of previous projects with mastication units indicates that desired conditions for soil structure and soil organic matter are met across 95 percent of units and soil structure desired conditions are met across 100 percent of units following completion of treatment activities. There were not any conditions found in the project area that would indicate a deviation from the monitoring data. The acres not meeting desired condition in table 20 are an overestimation of acres not meeting desired conditions. This is due to the fact that analysis was completed for the entire project area to simplify the process and provide for a “worst case scenario” evaluation. Acres for mastication will be far less than what was analyzed.

Prescribed Fire

Prescribed fire and pile burning can alter microbial communities in a forest stand by increasing the temperature of the post burn soil surface or by changing the availability of organic substrates. Soil heating during the burn results in a substantial short-term loss of microbial biomass or a shift in community structure. These changes, and their duration are the result of the interactions of fuel load, fuel moisture content, weather conditions, landscape position, light-up sequence, and resulting fire behavior and resident time combined with heat transfer variability within the soil profile (Busse et al. 2005). The low and moderate burn severities that are prescribed for this project would have short term impacts to soil organic matter and microbial communities. These impacts would not affect the long term productivity of the project area. If burn severities are kept to low

and moderate levels, soil organic matter desired conditions are expected to be met for prescribed fire and pile burning treatments. Recent soil cover monitoring of prescribed fire on the Forest for the best management practice monitoring report has shown that post-burn soil cover exceeds levels prescribed in standard and guides (USDA 2011). If soil cover guidelines are followed, soil stability desired conditions are expected to be met for prescribed fire treatments.

Temporary roads on existing roadbeds and landings

Existing roadbeds that are proposed for use as temporary roads would be cleared and graded; this would reduce soil cover levels during project implementation. Erosion from temporary roads would be mitigated by grading to out-slope and covering with slash, if needed, after the harvest season (prior to the first winter after use and prior to additional winters if used for more than one harvest season). Temporary roads would be hydrologically stabilized and closed after project completion, mitigating long-term erosion in the project area. With erosion control features in place before the start of the wet season, soil stability desired conditions are expected to be met for 95 percent of temporary roads.

Temporary roads have been recently used as part of the Lakeview Hazard Fuel Reduction Project. Minimal affects are anticipated to the existing roadbeds. Temporary roads on existing roads beds may cause reductions in infiltration and permeability. Research has shown that forest roads disrupt the physical environment through increased compaction and reduced porosity (Trombulak and Frissell 2000). While soil compaction would reduce infiltration and permeability, temporary roads and landings are not expected to meet desired conditions for soil organic matter and soil structure. Depending on the level of disturbance subsoiling some temporary roads would reduce the recovery time needed to promote desired conditions. Table 20 shows the estimated number of acres not meeting desired conditions based on previous forest monitoring data, this number includes the acreage not meeting desired conditions due to temporary roads and landings, and because these roads occupy only a minor part of the project area, it is below the 15 percent threshold listed in the forest plan.

Monitoring from previous projects has shown an increase in compaction and soil displacement leading to reduced infiltration on landings and temporary roads. Landings and temporary roads that have the upper soil layer displaced or compacted enough to affect hydrologic function are not expected to meet desired soil structure conditions. It is expected to be the same in the North Shore Project area.

To reduce the potential negative effects of landings and temporary roads, project design features have been developed to prevent damage from occurring, reduce the risk of further damage, and restore areas after damage has occurred. Impacts are prevented by limiting the extent of landings and main skid trails to 15 percent of unit’s area, operational slope limitation and ground-based equipment operation is restricted during periods of wet weather. The risk of future negative impacts is reduced by blocking access and hydrologically stabilizing landings and temporary roads. Finally, restoration of soil functions on landings and temporary roads would occur by subsoiling and seeding where it is practical to do so.

Wildlife

Listed and Forest Service Sensitive Species

The northern spotted owl is the only federally listed species that has the potential to occur within the project area due to habitat range and suitability. Forest Service Sensitive species that may be found within the project area include: Pacific martin, goshawk, bald eagle, fringed myotis, pallid bat, and Townsend's big-eared bat.

Environmental Consequences

Direct and Indirect Effects

Direct, indirect, and cumulative effects of the alternatives are summarized in table 21 below. Additional details regarding each species, affected environment and environmental consequences (direct, indirect effects) can be found in the Biological Evaluation, Biological Assessment, Management Indicator Species Report and the Neotropical Migratory Bird Report.

Action Alternatives (2, 3 and 5) indicate that there could be slight potential for direct and indirect effects. The same would hold true for cumulative effects.

Action Alternative 4, in the short term indicate that there would be could be slight potential for direct and indirect effects. However, in the long term, as indicated in the Botany report, non-native invasive plant species would continue to reduce plant (and thus animal) diversity (due to spreading invasive seeds during ground disturbing activities, and not offering control by herbicide), thus a reduction in suitable habitat and potentially connectivity, within the project area.

The No Action Alternative (Alt 1) for the short term, would maintain habitats in existing conditions and trends. There would be no immediate change in snag density or recruitment of large snags and no habitat restoration would occur. fuels levels would increase due to fire killed trees falling, resulting in larger re-burn potential (Fire and Fuels Report pg 2) which in turn would reduce the potential to restore NSO habitat in the long term by reducing the potential to regrow our mixed-conifer forests in this area. The Fire and Fuels report prepared for this project indicates that risk of high fire severity would increase in ten years post-fire for much of the fire area and that project activities are likely to reduce the size and impact of future reburns in the project area, thus allowing the forests time to regrow. Allowing the forests time to regrow would be beneficial to the NSO and other species that require similar habitat.

Table 21.Summary of Direct and Indirect Effects and associated Species Determinations

Species and habitat description	Direct and Indirect Effects	Alternatives	Determinations
Northern Spotted Owl (require mature forests with dense canopies)	No effect on nest/roost habitat (none in project area). Foraging and dispersal habitat will remain as such. No nest/roost habitat within 0.25 miles of project area. (hazard quotient <1)	Alternatives 2-5	May affect Not Likely to adversely affect due to large size of project area and potential of noise and smoke disturbance (no LOPs)
		Alternative 1, No action (short term)	No effect
Northern Goshawk (Mature to old growth forest with large trees and high canopy closure)	Project will not alter or reduce suitable habitat. Most likely only dispersal habitat for this species pre-Ranch Fire. Hazard quotient <1	All alternatives	No impact
Bald Eagle (Forested areas adjacent to large bodies of water)	No direct and indirect effects due to snag retention guidelines and number of snags left on the landscape. hazard quotient <1.	All Alternatives	No impact
Fringed myotis (caves, mine tunnels, rock crevices, old buildings), pallid bat (rocky outcrops), Townsend's big-eared bats (Montane forests with caves, cliffs, and rock ledges, and	Potential removal of roosting trees. Hazard quotient <1	Alternatives 2-5	May impact individuals, not cause a trend towards federal listing
		Alternative 1, No action (short term)	No impact

Species and habitat description	Direct and Indirect Effects	Alternatives	Determinations
may use abandoned mines and other manmade structures)			
Martin (Montane forests with mature and old conifer forests)	No suitable denning habitat. Hazard quotient <1	All Alternatives	No impact

Cumulative Effects

Within the North Shore project, the Mendocino National Forest also treated roadside hazards under the Bartlett Hazard Tree Abatement project. Under this CE there is a no effect determination to Northern spotted owl. Because there is no effect from Bartlett HTA there will be no added cumulative impacts to the North Shore Restoration project.

There were three Emergency Timber Harvest Plans (THP) proposed in 2019 within the North Shore project area ranging from 92 to 640 acres. The North Shore project's impacts should have little to no impact on spotted owls and not create adverse effects when combined with private land activities.

For FS Sensitive bat species, due to the extent of suitable snags that will be left within the project area (post treatment), the designation of LOPs around Pinnacle Rock and an unnamed rock outcrop near South Fork Long Valley Creek (May 15 – August 15) and the limited projects on going on private land within the planning area, no cumulative effects are anticipated for the Townsend's big-eared bat, pallid bat, or fringed myotis.

Because of the limited direct and indirect impacts to all other FS sensitive species (salvage, fuels, herbicide use) on public land or private, no cumulative effects are anticipated by any of the proposed actions.

Management Indicator Species

The Management Indicator Species (MIS) and associated ecosystem components for the Mendocino NF are identified in the LRMP (1995). The habitats/ecosystem components and associated MIS that could be potentially affected by the North Shore Project are listed in table 22 below:

Table 22. Selection of MIS for Project-Level Habitat Analysis for the North Shore Restoration Project

Habitat or Ecosystem Component	Mendocino NF Management Indicator Species *Scientific Name*
Snags	Acorn Woodpecker, Douglas tree squirrel, fisher, northern goshawk, marten, pileated woodpecker, northern spotted owl, western gray squirrel
Shrub habitat	Black-tailed deer, California thrasher
Dead & Down (i.e. Course Woody Debris – CWD)	Fisher, northern goshawk, marten, pileated woodpecker, northern spotted owl

Environmental Consequences

Direct and Indirect and Cumulative Effects Summary

The project would not have significant adverse effects on pileated and acorn woodpeckers, western gray and Douglas squirrels, black-tailed deer and California thrasher (and thus this type of habitat they represent), based on the following determinations:

- While snag numbers would be reduced within the project area, (specifically within the approx. 500 acres of salvage), the required amount of snags would be left within the salvage units, and an abundance of snags would remain outside of the salvage units (39,500 acres) due to design criteria in place.

- Salvage units are mostly within moderate to high severity burned stands. The resulting stand conditions (canopy closures and 50 to 100% tree mortality) now provide low capability of suitable habitat for these species. Treatments would not further reduce the habitat capability of the area due to severity of the burn within the proposed salvage units.

- Outside of the salvage units, all trees and snags greater than 21 inches DBH will be retained, unless are deemed a hazard. Snag requirements within the salvage units will provide the optimum level of snags needed per acre per LRMP 1995.

- CWD will be retained at the level of 5 – 20 tons/acre. This retention contributes to stand structure and diversity as the forests begin to mature.

Based on the above determinations, my conclusion is that the proposed action would not have adverse effects on habitat for these species: and that the proposed action complies with the standards in the LRMP regarding site specific evaluations for Management Indicator Species.

For detailed explanation of effects see North Shore Restoration Project MIS Report 2020. Species not included in the MIS analysis are analyzed in the Biological Evaluation and/or Biological Assessment.

Finding of No Significant Impact

As the responsible official, I am responsible for evaluating the effects of the project relative to the definition of significance established by the CEQ Regulations (40 CFR 1508.13). I have reviewed and considered the EA and documentation included in the project record, and I have determined that the North Shore Restoration Project will not have a significant effect on the quality of the human environment. As a result, no environmental impact statement will be prepared. My rationale for this finding is as follows, organized by sub-section of the CEQ definition of significance cited above.

Context

For the proposed action and alternatives, the context of the environmental effects is based on the environmental analysis in this EA. The analysis contained in the EA and in support documents of the EA indicate that the proposed action will not pose significant short- or long-term effects.

The geographic extent of the proposed action is limited to 40,000 acres in the Mendocino National Forest in the location described under the heading Project Area Map page 2 and shown on the Project Vicinity Map the page 3 of the EA. Proposed treatments focus on reducing the fuel loading of fire-killed and fire-injured trees. the treatments employing various methods such as salvage harvesting a small percentage (1%) of the project area. Initiates multiple fuels treatment activities, provides for reforestation, and treatment of invasive noxious weeds. In addition, Alternative 2 will have a benefiting effect to public safety; reducing the difficulty and danger of suppressing wildfire; improving the ability of the landscape to withstand the adverse effects of future wildfires and maintaining current and future public access to NFS lands., Only with active management could the objectives for this area be achieved.

Alternative 2 will conduct salvage harvest on approximately one percent of the 40,000 acres of National Forest System lands that burned within the project areas perimeter, thereby retaining ninety-nine percent of the National Forest System lands in the project area in an un-salvaged condition

The watershed cumulative effects analysis area is bound by watersheds by 14, 7^{th} field watersheds that have the potential to be impacted and totals approximately 92,000 acres. The North Shore Restoration Project proposes 582 acres of salvage treatments across approx. 0.6 percent of the watershed analysis area. The bulk of the area will be treated by various combinations of fuel treatments including prescribed fire, pile burning and jackpot burning, etc.

Salvage logging will not occur on any suitable or critical northern spotted owl habitat. Fuels treatments are proposed to protect green island and any remaining NSO habitat. Alternative 2 is consistent with the management of Berryessa snow mountain national monument and management of the wildland urban interface.

Intensity

Intensity is a measure of the severity, extent, or quantity of effects, and is based on information from the effects analysis of this EA and the references in the project record. The effects of this project have been appropriately and thoroughly considered with an analysis that is responsive to concerns and issues raised by the public. The agency has taken a hard look at the environmental effects using relevant scientific information and knowledge of site-specific conditions gained from field visits. My finding of no significant impact is based on the context of the project and intensity of effects using the ten factors identified in 40 CFR 1508.27(b).

1. Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.

Consideration of the intensity of environmental effects is not biased by beneficial effects of the action. The effects of the proposed action on economics, safety, forest vegetation, fire and fuels, air quality, aquatic and terrestrial wildlife resources, soil productivity, hydrology and water quality, recreation, and cultural resources, are described in detail beginning in Section titled Environmental Impacts of the Proposed Action and Alternatives (refer to the Table of Contents) Both beneficial and adverse effects have been taken into consideration when making the determination of significance. Beneficial effects have not, however, been used to offset or compensate for potential significant adverse effects.

The proposed action will not result in significant adverse short- term or long-term effects. The management requirements incorporated into the project and described under each resource section of the EA, will ensure that any adverse impacts to resources are either avoided or reduced to a minimal level.

2. The degree to which the proposed action affects public health or safety.

There will be no significant effects on public health and safety because Alternative 2 removes only fire killed and dying trees to provide safe access to public lands. The project directly reduces the short and long-term risk of injury or death to the public, Forest Service employees and contractors. Removal of hazard trees and the subsequent treatment of activity slash effectively meet the desired conditions within the project by mitigating hazards and providing for public safety along roads and facilities. Effective ground cover would be provided to stabilize soils and reduce erosion potential while not exceeding fuel arrangement leading to hazardous fuel conditions. Removing hazard trees along roads also reduces immediate and long-term exposure to potential injuries that could result from having to buck downed logs out of the roadway.

The proposed action includes numerous potential treatments for small diameter material.

Under the no action alternative, hazardous conditions created by fire killed or injured trees (weakened trees with the potential to fall and strike roads or recreationist) along travel ways within the Fire perimeter would persist. Fire killed or

injured trees have the potential to alter roadways in some cases when they fall. The presence of unabated fire killed trees would create an unsafe environment for forest users, contractors and Forest Service employees. The no action alternative poses a serious threat to all persons entering into the burned area in any capacity.

If no treatment occurs dead standing and fallen snags influence suppression efforts by posing an unacceptable risk to firefighters. These snags ignite easily, block existing roads and trails, and complicate fire control measures by reducing fuel break construction rate and compromising fire control lines. Standing dead trees, burning or not, may fall at any time in any direction without warning. The landscape would be at a great risker of wildfires that would be difficult to control due to the high levels of standing and fallen snags and a complex arrangement of fuels (Refer to the Table of Contents for the location of the Fuels and Silviculture sections).

Proper mitigation measures to meet air quality requirements would be implemented under the North Shore Restoration Project. A prescribed fire planner would coordinate with the Lake County Air Quality Management District to mitigate emissions from fuel reduction burning following the California Code of Regulations Smoke Management Guidelines (Title 17). Burn plans would be designed and all fuel reduction burning would be implemented in a way to minimize particulate emissions. Prescribed fire implementation would coordinate daily and seasonally with other burning permittees both inside and outside the forest boundary, through the Lake County Air Quality Management District. Because of the mitigation measures applied and coordination with regulatory agencies and other prescribed burners any impacts are expected to be minimal.

The Smoke Management Guidelines include a daily burn authorization system that would regulate prescribed burning implemented under Walker Fire Recovery Project action alternative. This authorization system is designed to minimize smoke impacts on smoke sensitive areas, avoid cumulative smoke impacts, and prevent public nuisance. The burn authorization system would not allow more burning on a daily basis than is appropriate for the meteorological or air quality conditions. The system specifies the amount, timing and location of each burn event.

The harvest operation as proposed should result in a minimal increase in the risk of erosion. There should be minimal alteration of drainage patterns, because runoff would be dispersed by implementation of effective erosion control structures on roads, skid trails, and landings. The harvest operation as proposed should have little direct effects on soil productivity, water quality and/or quantity or flow regime (Refer to the Table of Contents for the Hydrology and Soils Sections.). Project activities would require approximately 30 miles of road maintenance and repair. Some of this work will be directly related to minimizing risk of degradation of waters of the state as required by the Central Valley Water Quality Control Board through compliance with the Basin Plan and permit process.

3. Unique characteristics of the geographic area such as the proximity to historical or cultural resources, parklands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

   There will be no significant effects on unique characteristics of the area, because there are no park lands, prime farmlands, or ecologically critical areas within or

nearby the Walker Fire Recovery Project Area; hence, these resources would not be affected by the proposed action.

There will be no significant effects on unique characteristics of the area, because management requirements are being implemented to ensure that those resources are minimally impacted. There are perennial streams in the North Shore Restoration Project area and management requirements were applied to minimize effects (Refer to Table of Contents for the Hydrology section). Potential adverse effects associated with timber harvest activities within Riparian Reserve Areas will be avoided by implementing Best Management Practices (EA, Appendix B).

The project area has been inventoried and analyzed for the presence of cultural resources. Historic cultural resources include early roads and trails, abandoned, logging campsites and activity areas. (Refer to the Table of Contents for the location of the Heritage section.)

Pre-contact (aka prehistoric) cultural resources can include ancient seasonal encampments and resource procurement areas including flaked stone scatters of variable density. Fire recovery activities planned within the Project area have been designed to protect cultural resources as well as enhance conditions within and in proximity to these properties. All project activities, inventory efforts and protection measures adhere to the provisions of the National Historic Preservation Act of 1966, the 2018 Amended Region 5 Programmatic Agreement for Compliance with Section 106, and the Mendocino National Forest Heritage Program Plan. The proposed action will have no effect on cultural resources that are eligible or potentially eligible for listing on the National Register of Historic Places.

4. The degree to which the effects on the quality of the human environment are likely to be highly controversial.

   The effects on the quality of the human environment are not likely to be highly controversial. There is no known credible scientific controversy over the impacts of the proposed action. Public involvement throughout the planning process (EA, page 424) has not revealed any significant controversies regarding environmental effects of the proposed action.

5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

   The Agency has considerable experience with actions like the one proposed and to be implemented. The analysis shows the effects are not uncertain, and do not involve unique or unknown risk. Conditions present within the North Shore Restoration Project areas are similar to conditions under which salvage timber harvest, hazard tree abatement and removal, fuel reduction projects and road maintenance have been implemented on the Mendocino National Forest since adaption of the 1995 LRMP. The effects analysis shows the effects are not uncertain, and do not involve unique or unknown risks. The effects of the proposed action on the human environment are predictable, based on experience with past practices. The integrated management requirements included in the proposed action would reduce and minimize to the point of non-significance and were integrated on the basis of their proven effectiveness in protecting sensitive resources (EA, Appendix B).

6. The degree to which the action may establish precedent for future actions with significant effects or represents a decision in principle about a future consideration.

The action is not likely to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration. The Mendocino National Forest may implement similar projects as necessary to manage forest resources in the future. Any future projects would follow similar processes and project planning analysis, including public involvement, be analyzed separately and on their own merits, before decision would be made.

7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

Cumulative impacts are based on evaluating the direct and indirect effects of the proposed action in the context of other past, current, and planned future action in the project area and resource specific analysis areas. The cumulative impacts of the proposed action are not significant and area described in detail in the section titled Environmental Impacts of the Proposed Action and Alternatives (refer to the Table of Contents). Cumulative effect are address for safety, forest vegetation, fire and fuels, air quality, aquatic and terrestrial wildlife, soil productivity, hydrology and water quality, recreation, and cultural resources.

No cumulative effects were identified as part of the EA process.

8. The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

The action will have no significant adverse effect on districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places, because the project complies with Section 106 of the National Historic Preservation Act of 1966 (NHPA) and its implementing regulations found within 36 CFR 800. The Mendocino National Forest is a participant in the Regional Programmatic Agreement for Undertakings on the National Forests of the Pacific Southwest Region (2018 PA). In addition, the Forest utilizes the National Forest Heritage Program Plan and Cultural Resource Inventory Strategy that provides a Forest-specific inventory and program protocol for managing historic properties. An extensive records search, cultural resource field inventory and site monitoring program have all been completed for the North Shore Restoration Project. The Forest Heritage Program has found that by utilizing standard resource protection measures outlined within stipulation 1.0 and 2.0, Appendix E of the 2018 PA, the project will have no effect to historic properties. Provisions for Project activities within site boundaries may be approved prior to or during project implementation on a case-by-case basis at the discretion of the Forest Archaeologist/Heritage Program Manager (HPM) or delegated District Archaeologist. Such measures must be approved prior to any actions within site boundaries and documented accordingly.

If any unanticipated cultural resources are discovered during project implementation, operations would cease in the immediate vicinity of the new discovery until the HPM and/or District Archaeologist can assess the significance of the resource and can implement adequate protection measures as needed. Flag and avoidance of cultural or heritage sites will avoid adverse effects to those resources.

9. The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

   The Biological assessment for listed wildlife species has been completed to document analysis of the potential effects of the alternatives on one listed species, the northern spotted owl (*Strix occidentalis caurina*) and its habitat. This analysis, which is summarized under the wildlife analysis starts on page 56 of the EA and presented in detail in the Biological Assessment for the North Shore Restoration Project, provided the basis of consultation with USFWS.

   The Biological Assessment has been sent to U. S. Fish and Wildlife Service (USFWS) and it currently under review. The project actions currently find a may affect, not likely to adversely affect the northern spotted owl under the Endangered Species act of 1973.

   The Forest Service Biological Assessment concludes that this project is not likely to adversely affect this species due to lack of nesting/roosting habitat within the project area, maintenance of all habitat typed as foraging and dispersal, and because of the size of the project area there is a remote possibility that smoke and noise could affect the owl if present.

10. Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

    The action will not violate Federal, State, and local laws or requirements for the protection of the environment. The proposed action is consistent with the Mendocino National Forest Land and Resource Management Plan (1995). The North Shore Restoration Project is designed in a manner that is consistent with Forest Plan direction as described in the EA beginning on page 9.

    Implementation of the proposed actions would not threaten a violation of Federal, State, or local law for the protection of the environment. Applicable laws and regulations were considered in the EA (Chapter 3, The proposed action complies with the National Forest Management Act (NFMA), Endangered Species Act (ESA), Clean Water Act, Clean Air Act, Migratory Land Bird Treaty Act, and the National Historic Preservation Act (NHPA), Central Valley Regional Water Quality Board, Lake County Air Quality Management District regulations, and other applicable codes and ordinances.

After considering the effects of the actions analyzed, in terms of context and intensity, I have determined that these actions will not have a significant effect on the quality of the human environment. Therefore, an environmental impact statement will not be prepared.

Opportunity to Comment

The Upper Lake Ranger District of the Mendocino National Forest, in collaboration with FireScape Mendocino, the Forest Service Regional Ecology program, and the Pacific Northwest Research Station, prepared a Draft Environmental Assessment (EA) as required by the National Environmental Policy Act (NEPA) for the proposed North Shore Restoration Project.

The Forest encourages and welcomes your comments and input on the Draft EA. Public questions and comments regarding the Draft EA are an integral part of the environmental analysis process. Comments will be used to help identify the sufficiency and adequacy of information and conclusions stated in the draft EA. To best assist the Forest Service, comments should be as specific as possible.

Pursuant to 36 CFR 218.25, comments on this project will be accepted for 30 days beginning on the first day after the date of publication of the legal notice in the paper of record (*Chico ER*, in Chico, California), which is the exclusive means for calculating the comment period. Those wishing to comment should not rely upon dates or timeframe information provided by any other source. If the comment period ends on a Saturday, Sunday, or federal holiday, comments will be accepted until the end of the next federal working day. The deadline for comments will be posted on the forest website when it is confirmed.

The following questions are suggested to assist in formulating comments on the Proposed Action:

1) What are the pros and cons of the proposed action and each alternative and what are your preferences and why?

2) Are we considering all appropriate effects?

Comments addressed to specific alternatives and methods of treatment are especially helpful.

Your input on this project will help ensure success. Thank you for your interest and participation.

Contact

For additional information concerning this draft environmental assessment, contact: Frank Aebly, District Ranger at Frank.aebly@usda.gov or 707-275-1401.

Ann Carlson Date
Forest Supervisor

References

Ashton, D. T., Lind, A. J., & Schlick, K. E. 1998. Foothill yellow-legged frog (Rana boylii) natural history. USDA Forest Service, Pacific Southwest Research Station, Arcata, California.

Battles, John J., Ayn J. Shlisky, Reginal H. Barretta, Robert C. Heald, Barbara H. Allen-Diaz. 2001. The effects of forest management on plant speciesdiversity in a Sierran conifer forest. Forest Ecology and Management 146 (2001) 211-222.

Bohlman, G.N., North, M., Safford, H.D., 2016. Shrub removal in reforested post-fire areas increases native plant species richness. For. Ecol. Manage. 374, 195–210.

Busse, M.D., Hubbert, K.R., Fiddler, G.O., Shestak, C.J., Powers, R.F. 2005. Lethal temperatures during burning of masticated forest residues. International Journal of Wildland Fire. 14: 267–276.

Busse, Matt D.; Fiddler, Gary O.; Shestak, Carol J 2017, .Conifer Root Proliferation After 20 Years of Soil Compaction.

DiTomaso, Joseph M., Daniel B. Marcurn, Michelle S. Rasrnussen Evelyn A. Healy, Guy B. Kyser. 1997. Post-fire herbicide sprays enhance native plant diversity. California Agriculture, Volume 51, Number 1.

Cache Creek Fisheries Survey 2008 Technical Report. Stillwater Sciences. 2009.

Californiaherps.com. 2000. Foothill Yellow-legged Frog -Rana boylii. Retrieved June 24, 2015, from http://www.californiaherps.com/frogs/pages/r.boylii.html.

Coppoletta, Michelle; Merriam, Kyle E.; Collins, Brandon M. 2016. Post- fire vegetation and fuel development influences fire severity patterns in reburns. Ecological Applications. 26(3): 686-699. https://doi.org/10.1890/15-0225.

CWHR. California Department of Fish and Game, California Interagency Wildlife Task Group. 2008. CWHR version 8.2 personal computer program. Sacramento, CA.

Davis, C.J. 1998. Western pond turtle (Clemmys marmorata). Master's Theses. Paper 1694. http://scholarworks.sjsu.edu/etd_thesis/1694.

Fry, D.L., Dawson, J., Stephens, S.L., 2012. Age structure of mature knobcone pine forests in the northwestern California Coast Range, USA. Fire Ecol. 8, 49–62.

Holland, D.C. 1994. The Western Pond Turtle: Habitat and History. U.S. Department of Energy, Bonneville PowerAdministration,Environment, Fish, and Wildlife, PO Box 3621, Portland, OR 97208.

Jennings, M. R. and Hayes, M. P. 1994. Foothill yellow-legged frogRana boylii Baird 1854. In: Amphibian and Reptile Species of Special Concern in California. California Department of Fish and Game, Sacramento, California.

Johnson, Mara; Rew, Lisa J.; Maxwell, Bruce D.; Sutherland, Steve. 2006. The role of wildfire in the establishment and range expansion of nonnative plant species into natural areas: A review of current literature. Bozeman, MT: Montana State University Center for Invasive Plant Management. 80 p.

Keeley, J.E., Ne'eman, G., Fotheringham, C.J., 1999. Immaturity risk in a fire-dependent pine. J. Mediterr. Ecol. 1, 41–48.

LCCWPP. 2009. Lake County Community Wildfire Protection Plan, Lake County, California. http://www.lakecountyca.gov/Government/Boards/lcfsc/LCCWPP.htm.

Lanini, W.T., Radosevich, S.R., 1986. Response of three conifer species to site preparation and shrub control. Forest Sci. 32, 61–77.

Laurent T. 2007. Effects of Ground Based Forest Harvesting on Soil Disturbance, Bulk Density and Total Porosity on the Klamath national Forest (2004 to 2006).

Lovich, J. and Meyer, K. 2002. The western pond turtle (Clemmys marmorata) in the Mojave River, California, USA: highly adapted survivor or tenuous relict? Journal of Zoology London 256: 537-545.

McDonald, P.M., Fiddler, G.O., 2010. Twenty-five years of managing vegetation in conifer plantations in northern and central California: results, application, principles, and challenges. Gen. Tech. Rep. PSW-GTR-231. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, pp. 87.

Riegel, G.M., Miller, R.F., Krueger, W.C., 1992. Competition for resources between understory vegetation and overstory Pinus ponderosa in northeastern Oregon. Ecol. Appl. 2, 71–85.

Reilly, Matthew J., Vicente J. Monleon, Erik S. Jules, Ramona J. Butz.2019. Range-wide population structure and dynamics of a serotinous conifer, knobcone pine (Pinus attenuata L.), under an anthropogenically-altered disturbance regime.

Ryan, Kevin C.; Jones, Ann Trinkle; Koerner, Cassandra L.; Lee, Kristine M., tech. eds. 2012. Wildland fire in ecosystems: effects of fire on cultural resources and archaeology. Gen. Tech. Rep. RMRS-GTR-42-vol. 3. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 224 p.

Skinner, Carl N., Alan H. Taylor, and James K. Agee. 2006. Klamath Mountains Bioregion. In *Fire in the California ecosystems*. ed. Sugihara, Neil G., Jan W. van Wagtendonk, Kevin E. Shaffer, Jo Ann Fites-Kaufman, and Andrea Thode, Chap. 9, 612Berkeley, CA: University of California Press.

Sutton, R. F., 1993. Mounding site preparation : A review of European and North American experience. New Forests 7: 151-192, 1993.

Trombulak, Stephen C.; Frissell, Christopher A., 2000. Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities.

USDA Forest Service. 2015. Ecological Restoration: Engaging Partners in an all Lands Approach. Pacific Southwest Region, Vallejo, California.

USDA Forest Service. 1995. Mendocino National Forest Land and Resource Management Plan. Pacific Southwest Region, Vallejo, California.

USDA Forest Service. 2009. Forest Soil Disturbance Monitoring Protocol. Gen. Tech Report WO-82a.

USDA Forest Service. 2011. Klamath National Forest Best Management Practices Report 2011 Fiscal Year. Klamath National Forest Supervisors Office. 35p.

USDA Forest Service. 2012. Klamath National Forest Plan Monitoring Report 2012. Klamath National Forest Supervisors Office. 10 p.

USDA Forest Service. 2020. Bioregional Assessment, of Northwest Forests. July 2020

Vogl, R.J. (1973). Ecology of Knobcone pine in the Santa Ana Mountains. California. Ecol. Monogr., 43, 125–143.

Zedler, P.H., Gautier, C.R., McMaster, G.S., 1983. Vegetation change in response to extreme events: the effect of short interval between fires in California chaparral and coastal scrub. Ecology 64, 809–818.

Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer, and M. White, eds. 1988-1990. California's Wildlife. Vol. I-III. California Depart. of Fish and Game, Sacramento, California.

Appendix A- Maps

Maps are included in body of the environmental assessment.

Appendix B- Project Design Features

Aquatics

All herbicide applications within the project area will be ground based and will not occur within streamside management zones.

Water drafting pumps should not exceed 350 gpm and screening devices shall be used to minimize any impacts to Clear Lake hitch. Screen mesh openings should not exceed 3/32 inch in diameter.

Botany

Known occurrences of Endangered, Threatened, and Sensitive plant species are flagged for avoidance with yellow-and-black striped flagging prior to implementation. The following specific activities should be avoided within a flagged avoidance area:

- Constructing landings
- Decking logs
- Creating burn piles, either by hand or with machines
- Use of heavy equipment, including masticators
- Planting trees, except under the guidance of a Forest Service botanist

Geology

Common to all actions:

- For safety, workers should be aware that they are within active landslide areas and serpentine soil areas where there is the potential for naturally occurring asbestos. Workers should take reasonable precautions.
- Protect known caves from being physically disturbed by project activities.

Salvage:

- Exclude heavy machinery and salvage (harvest) activities from unstable areas (riparian reserves) such as landslides and inner gorges. Inner gorges are streamside slopes above 65% slope.
- Construct landings where hillslopes and fills would remain stable.
- If a previously unmapped suspected landslide is located during implementation, contact the project geologist to verify its status.

Reforestation/Planting

- Exclude heavy machinery from unstable areas (riparian reserves) such as landslides and inner gorges. Inner gorges are streamside slopes above 65% slope.
- Hand site-prep and planting in slow-moving unstable areas may be allowed after consultation with the project geologist.

- With exception of invasive plants, do not apply herbicide on native vegetation or non-invasive vegetation in the inner gorge, on landslides, or immediately adjacent to caves. Inner gorges are streamside slopes above 65% slope.

Fuels Reduction

- Do not operate heavy machinery in unstable areas such as landslides and inner gorges; hand-thinning and prescribed fires with limited tree mortality to meet fuel loading objectives are allowed. Inner gorges are streamside slopes above 65% slope.

- For safety and protection of serpentine soils, do not operate mechanical equipment within serpentine soils. Review applicable safety guidelines for areas that may have Naturally Occurring Asbestos.

- For safety and protection of serpentine soils, do not drag vegetative material through serpentine soils. Review applicable safety guidelines for areas that may have Naturally Occurring Asbestos.

Heritage

If new archaeological resources are located during project implementation, project activities will halt until the district archaeologist can assess the situation.

Standard Protection Measures will be needed to protect the 32 untested archaeological sites within the project APE. All archaeological sites have been flagged for avoidance from ground disturbing activities. Orange and white diagonal striped flagging tape was used along the perimeter of each site. These flagged areas can have hazard trees felled but not removed by skidding or other ground disturbing actions. Those felled trees can be cut and portions removed using a crane/self-loader which can reach into the flagged site boundaries to pluck the logs (full suspension) and remove them without ground disturbance (Class II SPM: 2.2(a)(2,4). As many of the archaeological sites may be bisected by the project roads, the road bed is open for use by mechanical equipment and minor skidding if needed. To insure that any on-site hazard trees are removed according to these stipulations, the District Archaeologist or their designee shall monitor (SPM 1.5) work within site boundaries during implementation. Project implementers shall contact the District Archaeologist prior to implementation to insure that all sites are flagged and to coordinate any monitoring logistics.

Slash piling needs to be located off site, removed by hand without skidding. If portions of felled trees extend off site, they may be cut at the site boundary with only the portion outside of the site boundaries removed using skidding, or other ground disturbing methods.

These types of activities must be identified on each site with an archaeologist present to insure the protection of historic properties. On rare occurrence, a tracked loader may be allowed on site within a previously disturbed area as long as an archaeologist is present.

Isolates, or non-formally recorded resources have limited quantities of cultural materials, have no historic context (i.e., fences, ditches, etc.) or are modern. No protection measures/recommendations are required for isolates.

The six heritage properties that have been tested and determined ineligible for listing in the National Register. These properties require no protection measures due their National Register status.

Elem Indian Colony has expressed some interest in having an opportunity to monitor hazard tree removal implementation. The Forest shall make a good faith effort to facilitate Tribal monitoring opportunities to the degree that it is safe.

If any new heritage resources are discovered during project implementation, all work in that area will cease, and the Forest or Zone archaeologist will be notified in order to evaluate the significance of the resource.

Hydrology and Soils

Best Management Practices

Forest management and associated road building in the steep rugged terrain of forested mountains has long been recognized as sources of non-point water quality pollution. Non-point pollution is not, by definition, controllable through conventional treatment means. It is controlled by containing the pollutant at its source, thereby precluding delivery to surface water. Sections 208 and 319 of the Federal Clean Water Act, as amended, acknowledge land treatment measures as being an effective means of controlling non-point sources of water pollution and emphasize their development.

The Forest Service have developed and documented non-point pollution control measures to National Forest System lands. These measures were termed “Best Management Practices” (BMPs) and are designed to accommodate site specific conditions. They are tailor-made to account for the complexity and physical and biological variability of the natural environment.

The following BMP’s have been identified to address watershed management concerns. These BMPs come from the 2012 Forest Service publication “National Best Management Practices for Water Quality Management on National Forest System Lands.” The implementation monitoring is done after the project has been completed, but before the winter season. Effectiveness monitoring is then completed on year later to determine success of BMP implementation.

All work and hauling should be done outside of the rainy season when soils are dry and potential damage to roads are minimized.

Chem 3 (Chemical Use Near Waterbodies)

Objective: Avoid or minimize risk of chemical delivery to surface water or groundwater when treating areas near waterbodies.
Application: Some chemicals used in terrestrial applications are toxic to aquatic flora and fauna, any overly enrich aquatic systems, and may pose a human health hazard if drinking water sources are contaminated during or after chemical applications.

To help protect surface waters and wetlands from contamination, a buffer zone of land and vegetation adjacent to the waterbody will be designated. Spill contingency plan would also be implemented if a spill occurs.

Chem 5 and Road 10 (Chemical Handling and Disposal/ Equipment Refueling and Servicing)

Objective: Chem 5- Avoid of minimize water and soil contamination when transporting, storing, preparing, and mixing chemicals; cleaning equipment or disposing chemical containers.
Road 10- Avoid or minimize adverse effects to soil, water quality, and riparian resources from fuels, lubricants, cleaners, and other harmful materials discharging into nearby surface waters or infiltrating through soils to contaminate groundwater resources during refueling and servicing activities.
Application: Handling chemicals, chemical containers and equipment (including petroleum-based) can lead to contamination of surface water or groundwater if not done carefully. Spills, leaks, or wash water can contaminate soil and leech into groundwater. Residue left on containers or equipment can wash off during precipitation events and enter surface waters.

Containers should be inspected on a regular basis to ensure no leaks, and stored away from riparian reserves. Spill kits should be available in case of an accidental spill. All waste should be disposed of according to state, federal and local regulations.

Road 4 (Road Operations and Maintenance)

Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by controlling road use and operations and providing adequate and appropriate maintenance to minimize sediment production and other pollutants during the useful life of the road.
Application: Consideration is given to the potential water quality effects from road damage when oversize or overweight loads are driven over forest roads. Roads should be routinely inspected to ensure they are not being impacted by log trucks. Water all dirt roads to minimize dust.

Veg 2 (Erosion Prevention and Control)

Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by implementing measures to control surface erosion, gully formation, mass slope failure, and resulting sediment movement before, during, and after mechanical vegetation treatments.

Application: The process of erosion control has three basic phases; planning, implementation, and monitoring. During planning, areas subject to excessive erosion, detrimental soil damage and mass failure can be identified and avoided. Suitable erosion control measures are implemented while the maintenance of implemented measures will ensure their function and effectiveness over their expected design period.

The potential for accelerated erosion or other soil damage during or following mechanical treatments depends on climate, soil type, site conditions, and type of

equipment and techniques used at the site. Erosion control measures are grouped into two general categories: structural measure to control and treat runoff and increase infiltration and nonstructural measures to increase ground cover.

Veg 3 (Aquatic Management Zone) (also Riparian Reserves and Streamside Management Zones)

Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources when conducting mechanical vegetation treatment activities in AMZ.
Application: Designation of an AMZ around and adjacent to waterbodies is a typical BMP to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources. Mechanical vegetation treatments are a tool that can be used within the AMZ to achieve a variety of resource-desired conditions and objectives when implemented with suitable measures to maintain riparian and aquatic ecosystem structure, function, and processes. Depending on site conditions and resource-desired conditions and objectives, mechanical vegetation treatments in AMZ could range from no activity or equipment exclusion to purposely using mechanical equipment to create desired disturbances or conditions. When treatments are to be used in AMZ, a variety of measures can be employed to avoid, minimize, or mitigate soil disturbance, damage to waterbody, loss of large woody debris recruitment, and shading, and impacts to floodplain function.

Veg 4 (Ground-Based Skidding and Yarding Operations)

Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during ground-based skidding and yarding operations by minimizing site disturbance and controlling the introduction of sediment, nutrients, and chemical pollutants to waterbodies.

Application: Ground-based yarding systems include an array of equipment from hoses, rubber-tired skidders, and bulldozers, to feller or bunchers, forwarders, and harvesters. Each method can compact soil and cause soil disturbance, though the amount of impact depends on the specific type of equipment used, the operator, unit design, and site conditions. Ground-based yarding systems can be designed and implanted to avoid, minimize, or mitigate potential adverse effects to soils, water quality, and riparian resources.

Veg 5 (Cable and Aerial Yarding Operations)

Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during cable and aerial yarding operations by minimizing site disturbance and controlling the introduction of sediment, nutrients, and chemical pollutants to waterbodies.

Application: Cable and aerial yarding systems partially or fully suspend logs off the ground when yarding logs to the landing. They include skyline cable, helicopter, and balloon systems that typically are used in steep, erodible, and unstable areas where ground-based systems should not operate. Soil disturbance and erosion risks from these systems are primarily confined to cable corridors and landings.

Veg 6 (Landings)

Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from construction and use of log landings.
Application: Landings are generally sites of intense activity, with lots of equipment working in these concentrated areas. Chemicals and fuels are often stored at these locations to service equipment, leaving a high probability of soil compaction, overland flow, and soil contamination. Any chemical and fuel containers should be disposed of appropriately, in addition to any refuse (tires, chains, chokers, cables, and miscellaneous discarded parts). Contaminated soils should also be disposed appropriately. Provide ground cover where necessary to prevent erosion.

WatUse3 (Administrative Water Development)

Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources when developing and operating water sources for Forest Service administrative and resource management purposes.

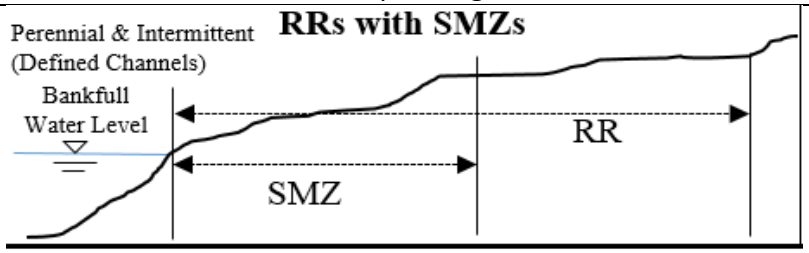
Application: Water source developments are needed to supply water for a variety of Forest Service administrative and resource management purposes, including dust control. Locations used for drafting should be preexisting locations, such as any of the boat ramps along Lake Pillsbury or under the bridge of M1, below Scott Dam. Utilizing a high volume pump will help prevent water trucks from having to back down into water (which could have an effect of water quality if the truck has a leak).

BMP Checklist

This checklist was created as an easy way to ensure all BMP's are followed. BMP's have been characterized for applicability for pre, during, and post project. (check boxes for each stage, greyed out boxes do not apply to that stage).

Pre	During	Post	BMP
			Chem 3- Chemical Use Near Waterbodies
			Implement the chemical spill contingency plan elements within the project safety plan if a spill occurs.
			Buffer of 10 feet when applied near any surface water
			Road 10- Equipment Refueling and Servicing/ Chem 5- Chemical Handling and Disposal
			Allow refueling and servicing only at locations well away from water or riparian resources.
			Transport and handle chemical/fuel containers in a manner that prevents leaks and spills.
			Inspect, secure, and check containers regularly.

Pre	During	Post	BMP
			Store any chemicals, including fuels, outside of Riparian Areas. Install contour berms and trenches around vehicle service and refueling areas, chemical storage and use areas, and waste dumps to fully contain spills if necessary.
			Have spill kit or containment device on hand.
			Dispose of containers and contaminated soils appropriately from NFS lands.
			Report spills and initiate appropriate clean-up action in accordance with applicable State and Federal laws, rules and regulations.
Road 4- Road Operations and Maintenance			
			Water all dirt roads used for hauling.
			Inspect roads/haul routes frequently to ensure roads are not being impacted by log trucks.
			Restrict use or modify route if road is being damaged, such as unacceptable surface displacement or rutting.
			Roads used for hauling will be graded.
Veg 2- Erosion Prevention and Control			
			No ground-based mechanical equipment entry into unstable areas (unstable riparian reserves), such as active landslides and inner gorges. Inner gorges are 65% and above slopes immediately adjacent to stream beds. They extend up slope until a slope break where slopes are less than 65% or at ridge top.
			Leave felled hazard trees if fuels density meets objectives.
			All water control features (especially on roads) must be repaired and in working condition post-haul or prior to big storms.
			Use existing landings where possible. New landing construction should follow Veg 6 practices.
			No ground equipment on road cuts/road fills over 25% slope.
Veg 3- Aquatic Management Zones (Riparian Reserves and Streamside Management Zones, RRs and SMZs)			
			Retain all riparian-associated vegetation within the SMZs and RRs of seeps, springs, and unstable areas.
			Crossings of streams must be approved by the district hydrologist or fish biologist.
			Tractor piling is not permitted within RRs or SMZs.
			Cover bare soil areas that exceed 50 sq ft with mulch or slash if the area is likely to deliver sediment to a stream.
			For RRs: On slopes <50%, retain at least 50% ground cover (litter, duff,

<table>
<tr><th>Pre</th><th>During</th><th>Post</th><th>BMP</th></tr>
<tr><td></td><td></td><td></td><td>rocks) evenly distributed across the treatment area. For slopes >50%, retain at least 70% ground cover.</td></tr>
<tr><td></td><td></td><td></td><td>SMZs have been identified and marked in the field with blue/white stripe flagging.</td></tr>
<tr><td></td><td></td><td></td><td>For SMZs: Retain at least 70% ground cover (litter, duff, rocks) evenly distributed across the treatment area.</td></tr>
<tr><td></td><td></td><td></td><td>For SMZ: <u>No ground-based mechanized equipment will be allowed in SMZ</u>.</td></tr>
<tr><td></td><td></td><td></td><td>For SMZ: Trees cut in the SMZ must be felled toward the RR. If it is necessary to remove the tree, it should be end lined or grapple skidded from outside of the SMZ, suspending one end where feasible.</td></tr>
<tr><td></td><td></td><td></td><td> 

<table>
<tr><th colspan="3">RR and SMZ width for each streamclass: (*Numbers are for EACH side)</th></tr>
<tr><td>Streamclass</td><td>Riparian Reserve Buffer</td><td>Streamside Management Zone Buffer</td></tr>
<tr><td>Perennial</td><td>300 feet</td><td>The greater of 100’ slope distance or to the slope break.</td></tr>
<tr><td>Intermittent</td><td>150 feet</td><td>The greater of 50’ slope distance to the slope break</td></tr>
<tr><td>Ephemeral</td><td>100 feet</td><td>20’</td></tr>
</table></td></tr>
<tr><td colspan="4">Veg 4- Ground-Based Skidding and Yarding Operations</td></tr>
<tr><td></td><td></td><td></td><td>Prohibit equipment in designated SMZ’s. Material may be removed from this zone; however, heavy equipment is excluded and would require review and approval by District or Forest Hydrologist for entry.</td></tr>
<tr><td></td><td></td><td></td><td>In Riparian Reserves, fell only trees necessary to meet project objectives. When felling trees, retain the highest stump possible.</td></tr>
<tr><td></td><td></td><td></td><td>Mechanical operations should occur during dry soil conditions; typically May 15-October 15. Operating during these times will minimize impact and reduce the potential for increased erosion.</td></tr>
<tr><td></td><td></td><td></td><td>Ground-based heavy equipment will be limited to stable slopes less than 35%. Occasional use on stable slopes up to 40% for a distance not to exceed 100 feet is acceptable.</td></tr>
<tr><td></td><td></td><td></td><td>Retain at least 50% ground cover (litter/duff/rock) across all treatment areas. Retention and even distribution of fine vegetation (rather than</td></tr>
</table>

Pre	During	Post	BMP
			rocks) should be favored for ground cover and nutrient cycling.
			Fall merchantable trees perpendicular to roads to minimize the skidding lengths.
			Align non merchantable hazards trees along the contour to create erosion control, if possible, given safety considerations.
			Preference for utilizing tracked feller bunchers.
			Maintain ALL live or possible re-spurouting vegetation for stability.
			Any soil displacement caused by the mechanical equipment greater than 4 inches in depth would be back bladed or water-barred to prevent water concentration.
			Remove any material resulting from project activities causing obstruction of stormflows, (immediately upstream of culverts).
			Ensure recognition and protection of areas related to water quality protection delineation on Sale Area Maps. The sale administrator and purchaser will review these areas on the ground prior to commencement of ground disturbing activities. Examples of water quality protection features that will be designated on the project map include: 1) Location of streamcourses and riparian reserves to be protected 2) Wetlands (meadows, lakes, springs, etc.) to be protected. 3) Unstable areas to be protected.
Veg 5- Cable and Aerial Yarding Operations			
			Locate cable corridors to efficiently yard materials with the least soil damage.
			No yarding across stream corridor (unless the logs are fully suspended).
			Postpone yarding operations when soil moisture levels are high that it would result in unacceptable soil disturbance.
			Whole tree yard when possible.
			Provide ground cover where needed.
			At least one end of the log should be suspended whenever possible.
Veg 6- Landings			
			Remove all logging machinery refuse (tires, chains, chokers, cables, and miscellaneous discarded parts).
			Install any suitable drainage features to prevent erosion.
			Provide ground cover where needed.
Water Use 3- Administrative Water Developments			
			Water will not be drafted from project-area streams

Pre	During	Post	BMP
			Below 4.0 cfs, drafting rates should not exceed 20 percent of surface flows.
			Draft from existing locations/ramps to Clear Lake
			Follow Road 10/Chem 5 to prevent contamination of fuels and chemicals into waterways.
			Water-drafting vehicles shall contain petroleum spill kits. Dispose of absorbent pads accordingly.

Appendix C – Invasive Plants Management Plan

Introduction

Non-native invasive plant species are among the most significant environmental and economic threats facing our country's – and indeed the world's – ecosystems. Invasive plants are defined as "non-native plants whose introduction does or is likely to cause economic or environmental harm or harm to human health" (Executive Order 13112, 1999). Invasive plants can create a variety of environmental effects that can be harmful to native ecosystem processes, including: displacement of native plants, reduced habitat and forage for wildlife and domestic livestock; alteration of physical and biological properties of soil, and loss/degradation of special habitats such as riparian areas and meadows. Economic costs include the direct cost of controlling invasive species, as well as indirect costs such as degraded livestock forage and lost or reduced recreation opportunities (USDA Forest Service 2013).

Treatment Strategy

Infestations of invasive species would be prioritized based on relative impacts and locations. Early invaders with high environmental impacts (as determined by the California Department of Food and Agriculture (CDFA) and the California Invasive Plants Council (Cal-IPC) and/or small, isolated infestations will be the highest priority for treatment. Infestations with a high potential for future spread, including those found in high traffic areas such as recreation sites, staging areas, and administrative sites will also be considered high priority. The leading edge or satellite occurrences of established infestations will be higher priority than the large established infestations themselves.

Treatment Methods

The proposed control approach will employ a combination of treatment methods. Successful treatments often require multiple years of treatment and multiple treatments per year. Treatments are tailored depending on the biology of the target species, site conditions such as density and age of infestation, and effectiveness of any prior treatment efforts. Treatments will include manual or mechanical methods such as hand pulling and cutting; these methods are previously approved for use in the project area and will continue to be used. Herbicide application is proposed in this project, and any herbicide will be applied by hand using backpack sprayers. Aerial or broadcast applications are not being proposed for this project.

Manual and mechanical methods are generally considered feasible when populations remain under a thousand plants and/or when woody species are small enough to be hand-pulled. Some species, including perennial species that resprout vigorously and/or have a deep or rhizomatous root system, can only be effectively controlled with herbicide. Specific herbicides proposed and target species for each are detailed below.

Current Conditions

The Ranch Fire area was widely (although not completely) surveyed for invasive species in 2019, especially targeting areas near roads and suppression disturbance. Based on these and previous surveys, there are 253 mapped locations of 13 different non-native invasive species within the North Shore project area. These sites comprise a total of 435 acres; see Table below.

Summary of invasive plant species found in the North Shore project area.

Species	Common Name	# Sites	Acres	Priority
Bromus madritensis ssp. rubens	Red brome	17	169.1	3
Bromus tectorum	Cheatgrass	20	109.6	3
Carduus pycnocephalus	Italian thistle	13	8.9	2
Centaurea melitensis	Maltese starthistle	9	1.6	2
Centaurea solstitialis	yellow starthistle	32	6.4	2
Cirsium vulgare	bull thistle	32	23.4	2
Foeniculum vulgare	sweet fennel	1	0.1	1
Hypericum perforatum	Klamathweed	56	10.8	2
Melilotus officianalis	white sweet clover	1	0.2	1
Rubus armeniacus	Himalayan blackberry	8	5.3	3
Spartium junceum	Spanish broom	2	0.4	1
Taeniatherum caput-medusae	medusahead	14	3.9	2
Verbascum thapsus	common mullein	48	95.7	2
TOTAL		**253**	**435.4**	

Each species is assigned a priority rank for treatment. Priority rank 1 species are targeted for eradication in the project area, due to the presence of very few sites and very little total acreage. Priority 2 species are targeted for control, with eradication of small and/or remote sites. Priority 3 species are generally fairly widespread on the landscape, and are targeted for containment. In addition to the species-level priority ranks, certain sites, such as landings, parking and staging areas, will also be assigned a higher priority for treatment.

Herbicide Application

The specific proposed herbicides are listed in Table below. All herbicides are registered for use in the USA as well as in California. The herbicides will all be applied at or below the label rate. Adjuvants are used to increase the efficacy and efficiency of herbicide applications. For the proposed applications, herbicides will tank-mixed with a methylated seed oil surfactant and a marker dye. The seed oil surfactant is used to increase sticking to the target species (reducing runoff), as well as increasing

penetration through the waxy cuticles common in plants. The marker dye is used to visually track application and thus minimize over- and under-application.

Proposed herbicides, target species, and maximum annual application rate

Herbicide	Target Species	Max. application rate
Aminopyralid	starthistle, thistles, klamathweed, sweetclover	7 oz/acre
Fluazifop	cheatgrass, medusahead, red brome	1 pint/acre
Imazapyr	mullein, fennel, landings	1 quart/acre
Triclopyr BEE	broom, blackberry	2 quarts/acre

Herbicide Treatment Procedures and Design Criteria

1. Herbicides will be applied by trained and/or certified applicators in accordance with label directions and applicable federal and state pesticide laws.

2. Weather conditions (wind speed and direction, probability of precipitation, temperature, temperature inversions, atmospheric stability, and humidity) will be carefully monitored before and during herbicide applications to minimize drift, volatilization, and leaching or surface runoff of herbicides, based on label instructions.

3. Prior to the start of spray applications, spray equipment will be calibrated to ensure accuracy of delivered amounts of herbicide. Equipment will be regularly inspected during herbicide applications to ensure it is in proper working order.

4. Herbicide spray applications will not occur when wind speeds exceed label restrictions. Consider application-specific factors (e.g. pesticide and adjuvant properties; application equipment, height, pattern and technique; target vegetation density, size, and acreage; proximity to sensitive resources; temperature and humidity; and wind speed and direction) to ensure spray applications do not result in unacceptable drift.

5. Herbicide application will be carefully evaluated following precipitation and/or when runoff, soil saturation, standing water, or heavy dew is present or expected, to ensure the application will not result in herbicides entering surface or groundwater. Application will occur only under favorable weather conditions, generally defined as: 20% or less chance of rain (based upon NOAA forecasting) within 48 hours of application.

6. Mixing and loading herbicides will take place at least 150 feet from any surface water, and will only occur on level, disturbed sites.

7. A spill cleanup kit will be readily available whenever herbicides are transported or stored. Proper Personal Protective Equipment (PPE) will be worn or carried by the applicator(s) at all times when using herbicides.

8. To limit overspray and drift during herbicide applications, low pressure nozzles with coarse droplets will be used, and spray nozzles will be kept as close as possible to target plants.

9. Equipment, vehicles, clothing, and personal items will be inspected and cleaned as necessary to ensure they are free of soil, seeds, vegetative matter or other debris prior to entering new treatment areas or moving from one infestation to another.

10. If any special status plant species are discovered in a proposed herbicide treatment area, no herbicide will be applied within 25 feet of the plants. Target invasive plants within this buffer will be treated manually.

11. No herbicides will be applied within 10 feet of any surface water, including streams, ponds, and wetlands.

Appendix D – Climate Change

Climate has varied significantly during the Neogene period in which most of the plant and animal species in the Ranch Fire region evolved, and while it's likely that most species will be able to adapt to altered climates to varying degrees, the rate at which climate change is occurring is unprecedented in the geological record (IPCC 2014). Climate change already affects ecological communities in the Ranch Fire region, and will do so to an increasing degree in the future. Knowledge about some effects of climate change in this region can be incorporated into project planning that can help offset those effects, but the full extent of climate change consequences is not yet well documented, and future surprises are inevitable. Scientific information about climate change effects indicates several conclusions and recommendations that may increase the resilience of lands and resources within the Ranch Fire recovery area:

The provision of ecological services by National Forest landscapes is an overriding objective of Forest Service guidance, including the Northwest Forest Plan, which constitutes an overall management focus for restoration in the North Shore Restoration Project, as well as for the entire region. Restoration plans for forests in the region will focus on establishing landscape composition, structure, and processes that sustain the delivery of ecosystem services in a climate-altered future, rather than on restoring stand composition and structure that developed under prior climate and fire regimes.

Climate change effects observed in, and projected in the future for, the Mendocino National Forest region include increased air temperatures, resulting in increased evaporative water demand (Climate Water Deficit), increased competition among plants for water and nutrients, and reduced resistance to insects and diseases. Projected effects on precipitation are less clear, but generally indicate less snow in the region. Weather events of unusually large magnitude may become more frequent.

Climate change is projected to result in increased fire occurrences in the region, resulting in large part from increased fuel aridity. The proximity of the North Shore Restoration Project to developed areas near Clear Lake increases the relative likelihood of future human-caused ignitions. The current accumulation of fuels in forestlands and the increased likelihood of fire ignitions in the wildland urban interface in the project area will likely alter fire regimes (greater frequency, larger area, greater intensity) on National Forest landscapes in the project area. Regimes with increased fire frequency may lead to type conversions from forests and woodlands to shrublands or to communities dominated by grasses and other fine fuels, further increasing the likelihood of fire ignition and rapid spread.

Fires with the size and severity of the Ranch Fire are essentially wind-driven rather than fuels-driven events. Management in forestlands likely will focus broadly on fuels, in order to limit the intensity of fires resulting from natural ignitions. Management in developed areas, however, likely will focus on increasing the safety of these developed areas by preventing ignitions and increasing the resistance to fire spread in neighborhoods where the houses themselves are the fuel in intense, wind-driven events. The Forest Service is neither charged with nor well-adapted to focus on fire management in developed areas, and management in these interface zones requires active collaboration among many parties.

Fuels management and a restoration of fire's productive and protective roles in forested landscapes are critical elements in adapting to the effects of climate change. Fuel loading throughout the North Shore Restoration Project area will be reduced to prevent increased mortality from future wildfires, including: (1) reducing understory shrub growth within forested restoration areas, and (2) removing, to the extent feasible, standing and down tree stems (snags, logs) from burned stands. Fuels reduction should be identified as an overriding goal that's essential for establishing climate-change resilience for the entire Ranch Fire area's recovery, including treatments in areas not otherwise included in restoration projects. Appropriate fuels management may require initially reducing existing fuel loads through mechanical and/or hand-based thinning, followed by a reintroduction of prescribed and/or managed fire. To the extent feasible, fire should be incorporated in managed landscapes at frequencies and intensities consistent with anticipated future climate; these frequencies and intensities may differ from historical conditions.

The combination of increased moisture stress and altered fire regimes in the region is projected to result in altered vegetation communities. Sprouting species (many broadleaved tree and shrub species) and grasses are likely to be favored over conifers in forests and woodlands at lower elevations, including the North Shore Restoration Project area. An increased fire frequency will favor increased shrubland areas (chaparral) at the expense of forests, together with an increase in shrub vegetation within forested areas; shrublands may be a more abundant self-replacing ecosystem type in the region under future climate and fire regimes. However, a significantly increased fire frequency may favor broad-scale conversions of forestlands and shrublands to grass-dominated areas.

Restoration plans for individual stands within the recovery region should incorporate science-based guidance addressing forest resilience in California, including: (1) incorporation of vegetation responses to natural variability in physical conditions that modify climate exposure, such as aspect, slope position, and existing soil moisture, since these factors affect the likelihood of survival and reproduction in different plant species; (2) inclusion of an 'ICO' stand structure in restoration projects, to capture the tendency of frequent-fire forests to develop this structure where suppression is absent; (3) retention of appropriate 'legacy' structural elements (e.g., large live trees and/or snags) in restoration stands to accelerate the development of complex stand characteristics, including the incorporation of habitat elements for wildlife species of management importance; (4) adoption of variability in planting and/or thinning practices used in restoration projects to achieve desired stand conditions, including broadening the species selected for restoration planting as well as in the arrangement of plants; (5) reducing stand densities to reflect increased competition resulting from increased evaporative moisture stress, reduced resistance to insects and diseases, and other direct and indirect effects of future climate; and (6) anticipating future climate effects by intentionally converting stands to compositions (e.g., conifers to hardwoods) that may be more capable of sustaining themselves in a climate-altered future.

Climate change has a high potential to result in future 'novel' or 'no-analog' plant and animal communities, because of an increased presence of species favored by altered climate and by more frequent fire. The Historical Range of Variation (HRV) concept does not provide a suitable objective for either stand-based or landscape-level restoration in the project area, as it does not incorporate adjustments to altered ecological conditions

that are projected to result from climate change. Recovery planning should consider the potentially beneficial functional roles of 'novel' species that may maintain ecosystem conditions and processes important for providing desired ecological services in a climate-altered future.

Guidance for National Forest planning (including the Northwest Forest Plan) states that forest management plans should incorporate a focus on landscape processes. Restoration plans for the North Shore Restoration Project should integrate management concerns for other lands in the region (especially non-Forest Service lands within the Berryessa Snow Mountain National Monument). An objective for climate change-adaption should be establishing and enhancing landscape connectivity within the Mendocino National Forest, and ultimately contributing to and enhancing landscape connectivity in northwestern California as a whole.

To the extent possible, planning for Ranch Fire recovery should strive to incorporate flexibility to adapt planned responses, either increasing or decreasing initially identified practices as additional information becomes available about the effects of altered climate, altered fire regimes, increasing knowledge about invasive species, and the many other parameters affecting the responses to these changes. See https://www.fs.usda.gov/project/?project=55716 for full report.

Appendix E – Silviculture Prescriptions for the Proposed Action

Project Design Criteria and Mitigation Measures

Salvage timber harvest of fire killed and injured (dying) trees will comply with the following prescriptions.

Matrix Salvage Units (RX 7 -Timber Modified)

Follow the Marking Guidelines for Fire-Injured Trees in California (Smith et al. 2011) and remove all merchantable fire killed trees (14" DBH or greater with a 0.7 or higher probability of mortality. Marking Guidelines for Fire-Injured Trees in California provide a method for determining the probability of fire injured tree to succumb to fire impacts. The probability of mortality rating is a number between 0 and 1, where, roughly speaking, 0 indicates impossibility and 1 indicates certainty expressed as a numerical description of how likely a tree is to die. The higher the probability, the more likely the tree will die. To determine species specific percent crown length killed for pines refer to Table 1 or Tables 2a and 2b when evaluating trees post-bud break for yellow pine. For sugar pine refer to tables 5, 6a or 6b. To determine percent crown volume killed for Douglas-fir refer to Table 9. For additional information refer to The Marking Guidelines for Fire-Injured Trees in California (Smith et al. 2011). (Note: The following tables have been copied from the Marking Guidelines for Fire-Injured Trees in California (Smith et al. 2011) Table numbers refer to the table number from these Marking Guidelines).

- Refer to Post Treatment Snag Retention guidelines described below.
- Refer to Post Treatment Coarse Woody Debris guidelines described below.
- Avoid extended skids (100 feet or more) across slopes steeper than 35 percent.
- Ground and Cable based timber harvesting systems are proposed for areas that have existing harvest systems in place.

100 Acre LSR Salvage Units (RX 6 -Late-Successional Reserves)

- Follow the Marking Guidelines for Fire-Injured Trees in California (Smith et al. 2011) and remove all merchantable fire killed trees (14" DBH or greater with a 0.9 or higher probability of mortality. Retaining standing live trees except for trees with a 0.9 probability of mortality will address the LRMP objective of including those injured that are likely to survive. Surviving trees provide a significant residual of larger trees in the developing stand. Defects caused by fire in residual trees may accelerate development of structural characteristics suitable for associated late successional species. Those damaged trees may eventually die, and will provide additional snags.
- Refer to Post Treatment Snag Retention guidelines described below.
- Refer to Post Treatment Coarse Woody Debris guidelines described below.
- Protect existing hardwood stump sprouts where possible.

- Prohibit extended skids (100 feet or more) across slopes steeper than 35 percent.
- Cable based timber harvesting systems from existing roads may be used.

Riparian Reserves (RX 4 -Minimal Management)

- Follow the Marking Guidelines for Fire-Injured Trees in California (Smith et al. 2011) and remove all merchantable trees with a 0.9 or higher probability of mortality.
- Refer to Post Treatment Snag Retention guidelines described below.
- Refer to Post Treatment Coarse Woody Debris guidelines described below.
- Directional felling will be used to protect streambanks.
- Maintain CWD in concentrations that do not create an unacceptable fire hazard.
- Timber harvesting in Riparian Reserves would occur under Alternative 2. SMZ's will be established as equipment exclusion zones.

Fuels treatment Trees less than 14 inches.

- Salvage units fuel reduction action shall be applied to fire killed or injured trees 14 inches in diameter or less. Treatment will be applied to trees that depending on market conditions may have value as biomass products, but do not have a commercial value as lumber products. Application may occur as a combination of prescribed burning, hand or mechanical harvesting, hand or mechanical piling, chipping, pile burning, or biomass removal.
- To reduce activity fuels, other surface fuels, and maintain them in the desired condition, prescribed fire may follow treatment.
- This treatment applies to all Salvage Units prescriptions for the proposed action.

Post Treatment Snag Densities:

- Retain fire killed conifer trees for snag retention at a rate of four of the largest snags per acre averaged over 40 acres of matrix area. Trees retained for snags maybe either Douglas-fir, ponderosa, or sugar pine where possible two of the four trees retained for snags should be Douglas-fir as Douglas-fir generally has a longer retention time frame. Cluster snag trees where such natural clumps of the largest trees in the stands occur, and scatter others where stands are more uniform in size. Retained snags maybe hard (recently killed) and soft (older, rotten, structurally weakened) snags where they are not a current or potential future safety or fuel hazard.
- Where snag densities exceed the metrics in the Fire and Fuels report follow the fuels prescription.
- Use variable spacing if possible in distributing snags to mimic natural stands. Snag spacing can be applied with flexibility to ensure that the most highly desired snags are retained. To maintain diversity and to avoid single tree species

retention, the species type retained would be in the same proportion as the species that occur naturally in the project area.

- Retain any tree with nests or stick platforms.
- Retain all pre-fire existing un-merchantable snags unless they pose a threat to human safety or occur in densities that could result in high fuels levels. Refer to the Fire and Fuels Report for more information.
- Retain all hardwood snags, particularly black oak snags over 12" DBH if they do not pose a safety or fuels hazard.

Post treatment Coarse Woody Debris (CWD)

- Maintain CWD in concentrations that do not create an unacceptable fire hazard.
- Maintain a minimum of 5 to 20 tons per acre of course woody debris comprised of a minimum of four recently-downed logs per acre, averaged over 40 acres of matrix area. When present focus retention on logs equal to or greater than 20 inches in diameter (large end), or the largest diameter logs available. Retained logs should range from 15 to 20 feet in length, with one log per acre greater than 20 feet in length. Where course woody debris CWD is deficit, defer Yarding of Unutilized Material (YUM) within the unit until required numbers and size classes are met.
- Retain coarse woody debris already on the ground and protect where feasible from disturbance during treatment (e.g. slash burning and yarding) and site preparation/Planting.
- Maintain all existing large logs unless they contribute to hazardous fuels levels
- Where feasible Retain coarse woody debris already on the ground and protect from disturbance during treatment (e.g. slash burning and yarding) and site preparation/planting.
- All coarse woody debris (CWD), greater than 20 inches in diameter at the large end and 10 or more feet in length (preferably over 20 feet), would be protected during harvest operation, fuels treatments and site preparation. If the amount of larger coarse woody debris (greater than 20 inches in diameter at the large end) is abundant enough to cause a hazardous fuels condition, a portion of these logs may be treated/removed. Remove the smallest logs first until fuels objectives are met. Retain the maximum number possible while still meeting fuels objectives.

Refer to Table 23 RAVG Burn Severity Salvage Area. Future fuel reduction treatment activities may be applied to these commercially treated acres. Refer to the Fire and Fuel prescription and the North Shore Restoration Project Fire and Fuels Report.

Table 23: RAVG Burn Severity Salvage Area

Salvage Area Burn Severity Classes	Acres	Total Percent Basal Area Loss
No Loss 0%	0	0%
Low 0-24%	38	6%
Mixed 25-49%	105	18%
High 50-74%	79	13%
Very High 75-100%	369	62%
Grand Total	592	

Marking Guidelines for Fire-Injured Trees in California (Smith et al. 2011)

The following tables have been copied from the Marking Guidelines for Fire-Injured Trees in California (Smith et al. 2011) Table numbers refer to the table number from these Marking Guidelines.

YELLOW PINE

Table 1 or Tables 2a and 2b are to be used when evaluating trees ***post-bud break***

Table 1. YELLOW PINE: percent crown length killed (PCLK) and DBH *(use post-bud break)**

Use Table 1 when only assessing crown injury.

Probability of mortality (Pm)	.10	.20	.30	.40	.50	.60	.70	.80	.90
DBH					Percent crown length killed (PCLK)				
10 - <30”	25	35	40	45	50	55	60	65	70
30 - 40”	--	5	10	15	25	30	40	45	60
>40 - 50”	--	--	--	5	10	15	25	30	45

Table 2a. YELLOW PINE: PCLK, DBH and red turpentine beetle pitch tubes PRESENT*

Use Tables 2a and 2b when assessing crown injury and red turpentine beetle presence/absence *Note: Use of this guideline is appropriate when significant red turpentine beetle activity is detected. FHP personnel can assist with this determination*

Probability of mortality (Pm)	.10	.20	.30	.40	.50	.60	.70	.80	.90
DBH					Percent crown length killed (PCLK)				
10 - <30”	10	30	35	40	45	50	55	60	65
30 - 40”	--	--	--	--	--	5	10	15	25
>40 - 50”	--	--	--	--	--	--	--	5	10

YELLOW PINE (continued)

Table 2b. YELLOW PINE: PCLK, DBH and red turpentine beetle pitch tubes ABSENT*

Probability of mortality (Pm)	.10	.20	.30	.40	.50	.60	.70	.80	.90
DBH	Percent crown length killed (PCLK)								
10 - <30"	30	35	50	55	60	65	70	75	80
30 - 40"	5	10	20	25	30	40	45	55	65
>40 - 50"	--	--	--	5	10	15	25	35	45

* When the cambium kill rating (CKR) is determined for **yellow pine,** *post-bud break*, use the following percent crown length killed adjustments for Tables 1, 2a and 2b: For yellow pine **10 - <30" dbh**, *add* 5 percentage points when CKR = 0 or 1, *no change* when CKR = 2, and *subtract* 10 percentage points when CKR = 3 or 4. For yellow pine **>30" dbh**, *add* 5 percentage points when CKR = 0 or 1, *no change* when CKR = 2, and *subtract* 5 percentage points when CKR = 3 or 4.

SUGAR PINE

Table 5: SUGAR PINE - percent crown length killed (PCLK)*

- Use Table 1 when only assessing crown injury.

Probability of mortality (Pm)	.10	.20	.30	.40	.50	.60	.70	.80	.90
DBH	Percent crown length killed (PCLK)								
10 – 60"	--	30	40	50	50	55	60	65	70

Table 6a: SUGAR PINE - PCLK and red turpentine beetle pitch tubes PRESENT*

- Use Tables 6a and 6b when assessing crown injury and red turpentine beetle presence/absence
  Note: Use of this guideline is appropriate when significant red turpentine beetle activity is noted. FHP personnel can assist with this determination.

Probability of mortality (Pm)	.10	.20	.30	.40	.50	.60	.70	.80	.90
DBH	Percent crown length killed (PCLK)								
10 – 60"	--	--	--	30	40	45	55	60	65

Table 6b: SUGAR PINE - PCLK and red turpentine beetle pitch tubes ABSENT*

Probability of mortality (Pm)	.10	.20	.30	.40	.50	.60	.70	.80	.90
DBH	Percent crown length killed (PCLK)								
10 – 60"	30	45	55	60	60	65	70	75	80

* When the cambium kill rating (CKR) is determined for **sugar pine**, use the following percent crown kill adjustments for Tables 5, 6a and 6b: *Add* 5 percentage points when CKR = 0 - 3 and *subtract* 20 percentage points when CKR = 4.

DOUGLAS-FIR (Hood 2008)

Table 9. DOUGLAS-FIR: percent crown volume killed (PCVK), and DBH *

- This guideline uses ***percent crown volume killed*** (not percent crown length killed). Visually estimate the volumetric proportion of crown killed compared to the space occupied by the pre-fire crown volume to the nearest five percent (Ryan 1982).

Probability of mortality (Pm)	**.10**	**.20**	**.30**	**.40**	**.50**	**.60**	**.70**	**.80**	**.90**
DBH	**Percent crown length killed (PCLK)**								
4 – 40”	--	10	25	55	65	70	75	80	90

* When the cambium kill rating (CKR) is determined for **Douglas-fir**, use the following percent crown kill adjustments for Table 9: *Add* 5 percentage points when CKR = 0, *no change* when CKR = 1, *subtract* 5 percentage points when CKR = 2, *subtract* 10 percentage points when CKR = 3, *subtract* 20 percentage points when CKR = 4.

Salvage Operations Snag Retention

Marking guidelines for fire-injured trees have been developed following guidance from Table 24 Snag retention guidelines from the Mendocino Land and Resource Management Plan 1995 for Montane Conifer. The marking guidelines require that the largest snags per acre (4 snags Rx7, 4 snags Rx6 and 4 snags Rx4) averaged over forty acres be retained. This could result in some units having a cluster of the largest snags in pockets.

Table 24: Snag retention guidelines from the Mendocino Land and Resource Management Plan 1995 for Montane Conifer

TYPE: Montane Conifer 1/			
HABITAT VARIABLE	**HIGH** (Optimum)	**MODERATE** (Sub-optimum)	**LOW** (Marginal)
Average density			
…15-24" DBH	>3.0/acre	1.2-3.0/acre	<1.2/acre
…>24" DBH	>0.5/acre	0.2-0.5/acre	<0.2/acre
…Total	>3.5/acre	1.43.5/acre	<1.4/acre
	(max = 10/acre)	(max = 5/acre)	(max = 3/acre)
Height	>40 feet	20-40 feet	<20 feet
Dispersion	One group per 5 acres or less, with 15+ snags	One group per 5-15 acres, with 5-15 snags	Even dispersion
Hard:Soft Ratio	>3:1	2:1-3:1	<2:1
Location	Edges of meadows, brush fields, streams, and other water	Throughout wooded stands	Rocky, open slope, Barren areas
Species	Douglas fir, Ponderosa pine, Sugar pine, Knobcone, Black oak, Blue oak, Madrone	Douglas fir, Ponderosa pine, Black oak	Douglas Fir, Black oak

1/Includes ponderosa pine, mixed conifer, Knobcone pine, coast range montane, mixed evergreen, and black oak

Forested Burned Areas not treated by Salvage Operations

Salvage operations are being applied to an estimated 592 acre area. Outside salvage treatment units there is substantial area of forest cover located within the burned area which burned at various levels of severity. Total conifer vegetation type consist of 4334 acre. Salvage treatment is being applied to 14 percent of the conifer acreage within the project area. The 3742 acre area where commercial salvage operations will not take place will be subject to treatment as part of the Fire and Fuels prescription.

The extent of proposed salvage treatment is driven by slope constraints and a desire to avoid new road construction. To expand the treatment area to slopes greater than 35 percent would require cable or helicopter logging. Cable logging would require some new temporary road construction; whereas, helicopter logging would eliminate the need

to construct new roads, but these logging systems were considered not economically feasible under current market conditions. Untreated burned areas will still have various levels of present and future fuel concentrations. Reduction in fuel loading in these areas will be provided through a combination of thinning (both mechanical and hand) and prescribed fire aimed to reduce fuels over time. Refer to the Fire and Fuels treatment prescription.

Site preparation

Treatments will be completed with the objective of preparing sites for reforestation. Treatment includes reducing hazardous fuels to levels described in the Fire and Fuels report, and reducing competition to the newly planted or naturally regenerated seedlings. Prior to planting site preparation needs will be evaluated based on exiting site conditions immediately before planting. Site preparation may be completed with both mechanized or hand treatments. One objective of site preparation is to leave enough material on the sites to provide microsites favorable for seedling survival. This includes down woody debris, standing snags, high stumps, and other features which create shade or help to reduce surface temperatures and increase the water holding capacity of the site. All treatments will comply with BMP's and other design features described in the Hydrology report as well as Appendix B of the Environmental Analysis. All site preparation treatments will avoid damaging any existing green trees that survived the wildfire.

Reforestation

Reforestation is an essential part of post-fire restoration. Reforestation efforts shall first begin in Areas where reforestation activates have previously occurred. Within the North Shore Restoration project area, both planting and natural regeneration will contribute to establishing forest cover ideal for watershed stabilization, wildlife habitat cover and forage, seed source establishment, regaining timber production, and aid in reaching desired future condition in recognition of potential climate change.

Reforestation of the sites will include planting seedlings grown from seed collected from Mendocino national Forest within California seed zone 372. This seed zone occurs primarily in the southern third of forest, Refer to Forest Seedling Network, 2013. Seed was either directly collected from the Mendocino National Forest, or collected from trees grown from grafted material on trees at the Chico seed orchard.

- Reforestation shall take place on approximately 1617 acres of conifer forestland where plantations were established in the past. These plantations burned at various levels of burn severity with 74 percent of the acreage burning at very high severity. Refer to Table 11 for burn severity values of reforestation units.

  Table 25: RAVG Burn Severity Reforestation Units

Reforestation Area Burn Severity Classes	Acres	Total Percent Basal Area Loss
No Loss 0%	1	0%
Low 0-24%	50	3%
Mixed 25-49%	156	10%
High 50-74%	215	13%
Very High 75-100%	1195	74%
Grand Total	1617	

In addition to the area covered by previous plantations, reforestation activities will be applied to areas covered by the Bartlett Hazard Tree Abatement CE (485 acres) and the NSRP areas proposed for salvage logging (592 acres). These areas have been identified as a priority to reforest in order to develop future conifer or conifer hardwood forests.

- In addition, reforestation may take place in other areas where conifer or hardwood tree removal will be accomplished by fuel reduction treatments. These area will be assessed following fuels treatment for regeneration needs.

- Reforestation shall be accomplished by low density planting with variable arrangement and species mix. (Refer to Figure 13 and 14.)

- To achieve desired future conditions, planting density will be at a level that provides for some mortality initially and over time. The seedlings will require monitoring to ensure adequate survival. If seedling densities of both natural and planted seedlings do not meet desired stocking level, sites should then be examined for additional planting needs. The examination should focus on any adjustments necessary to be made to correct problems which may have led to the failure of the first planting.

- Areas of low to moderate burn intensity have a higher probability for natural regeneration to be present. These areas are generally associated with the fuels treatment portion of the restoration project. They will be surveyed and evaluated for density and species composition after treatment and prior to any planting action.

- All planted seedlings will have scalps dug at the time of planting and holes will be dug using either power augers or hand tools. Other standard planting, release, and thinning practices will apply.

- Trees will be planted using one of three methods: Individual tree planting 14 feet x 14 feet spacing, clustered tree planting, or a combination of the two methods. Areas where a 14 foot spacing is applied will have planting locations scalped, holes augured or hand dug (Refer to Figure13). A total of 222 tree per acre will be planted using this method. When applying the cluster planting configuration as shown in Figure 14, a total of 210 trees per acre will be planted and arranged as seventy clusters of three trees distributed across each planting acre. Plot centers will have an average spacing of 25 feet between planting clusters center points. Individual tree locations should randomly vary within the 10 foot radius planting circle avoiding any semblance of a straight line to create spatial heterogeneity. Planted trees shall have 10 foot minimum spacing distance along the planting circle. If natural regeneration, defined as any conifer species that dominated the

forest (Douglas-fir, ponderosa pine, or, sugar pine) or black oak stump sprout or seedling, are on the site they will be incorporated into the clusters or individual tree design. In areas where a combination of the two planting designs is determined appropriate by the silviculturist, these areas will have a minimum planting density of 200 trees per acre. Example where the combination method may be applied is along the first 100 feet from a roadside where cluster planting would occur then after that distance revert to 14 foot spacing.

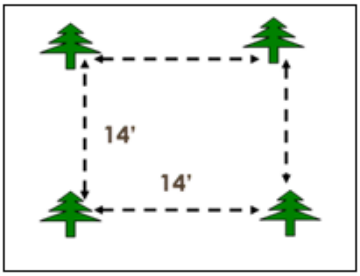


Figure 13. Individual Tree Spacing

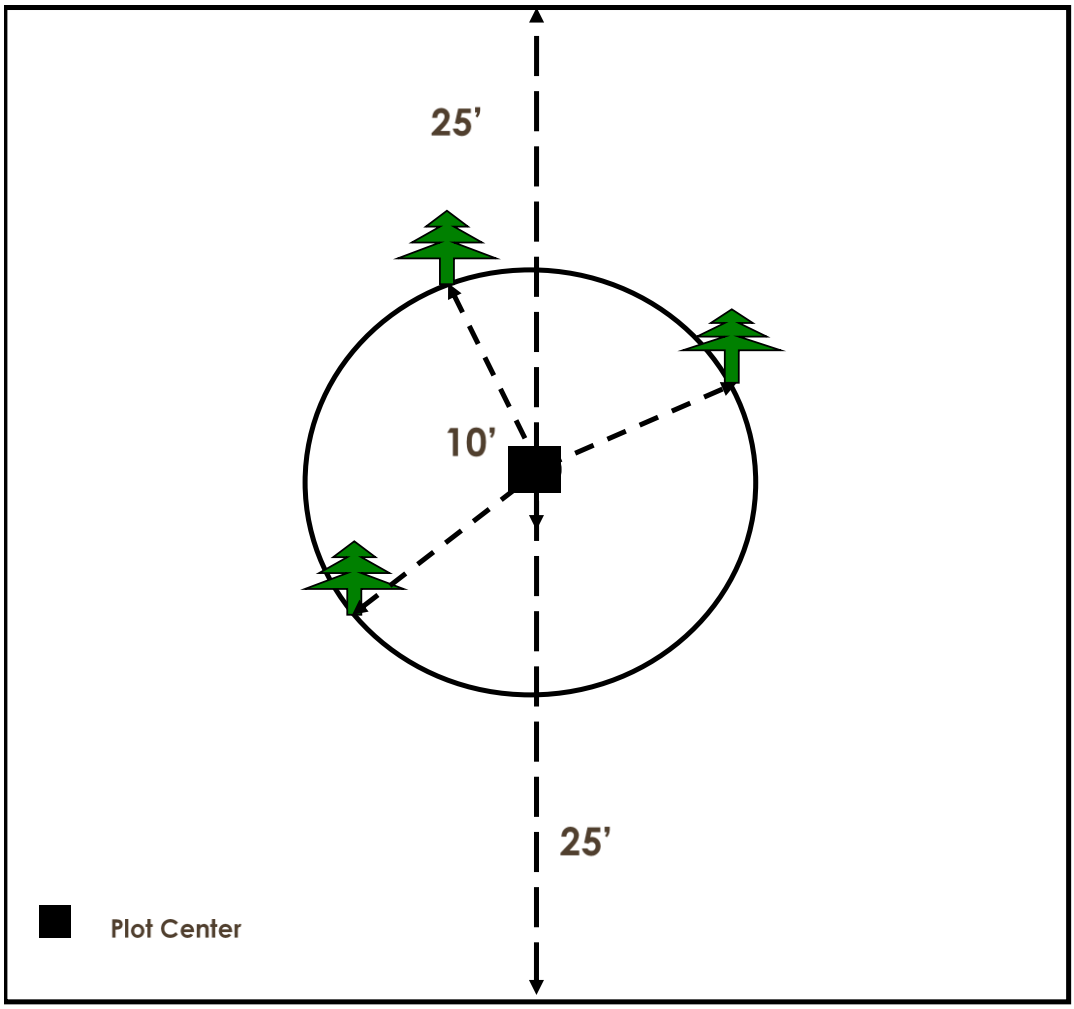


Figure 14: Cluster Planting Diagram

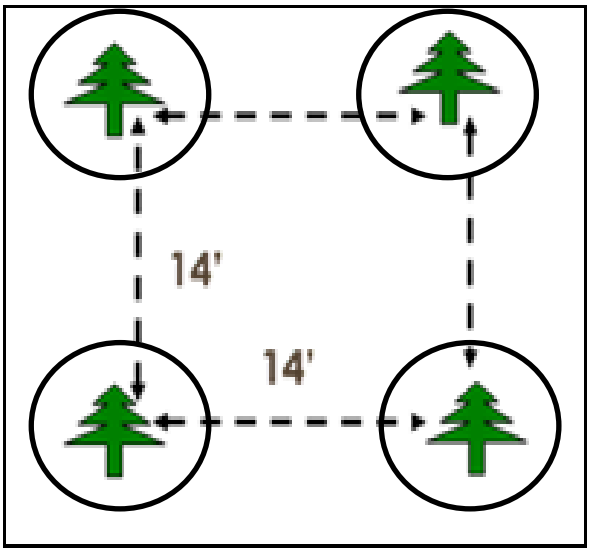
Release for Survival

After successful reforestation seedlings and natural regeneration may need to be released from competition where necessary to promote survival and growth of seedlings. This will be determined through on site monitoring efforts.

Within the first 1-3 years planted areas will be monitored to determine the need for competing vegetation control. Potential treatment will involve, hand or mechanical grubbing of grasses and other competing vegetation away from the trees in a 5 foot radius circle. (Refer to Figure 15.)

As a substitute to hand or mechanical grubbing, herbicide treatment is proposed to control shrub species. This treatment will also be applied to a 5 foot radial treatment around seedlings to kill competing shrub vegetation. (Refer to Figure 16.) Herbicide treatment will be applied for survival for the first 1-3 year period, and targets only

shrubs to allow for maintenance of a reduced shrub cover within the planted area. Initial herbicide treatment is expected to be adequate for most sites.
After the first 3 year period, the planted areas will be inspected for the need of additional herbicide treatment. Should shrub densities require treatment herbicides may be applied to impede growth or reduce shrub cover within planted areas for the next ten to fifteen years on an as needed basis. These treatments will be limited to a 5 foot radial treatment around trees to kill competing shrub vegetation. The 10 foot diameter treatment zone around each tree planted at a 14 foot spacing represents on a per acre basis applying herbicides to approximately 40 percent, leaving 60 percent of the acre not treated with herbicides. The ten foot diameter treatment zone around each cluster planted tree represents on a per acre basis applying herbicides to approximately



38 percent leaving 62 percent of the acre not treated with herbicides.

Figure 15: Ten Foot diameter Treatment Area for each Tree

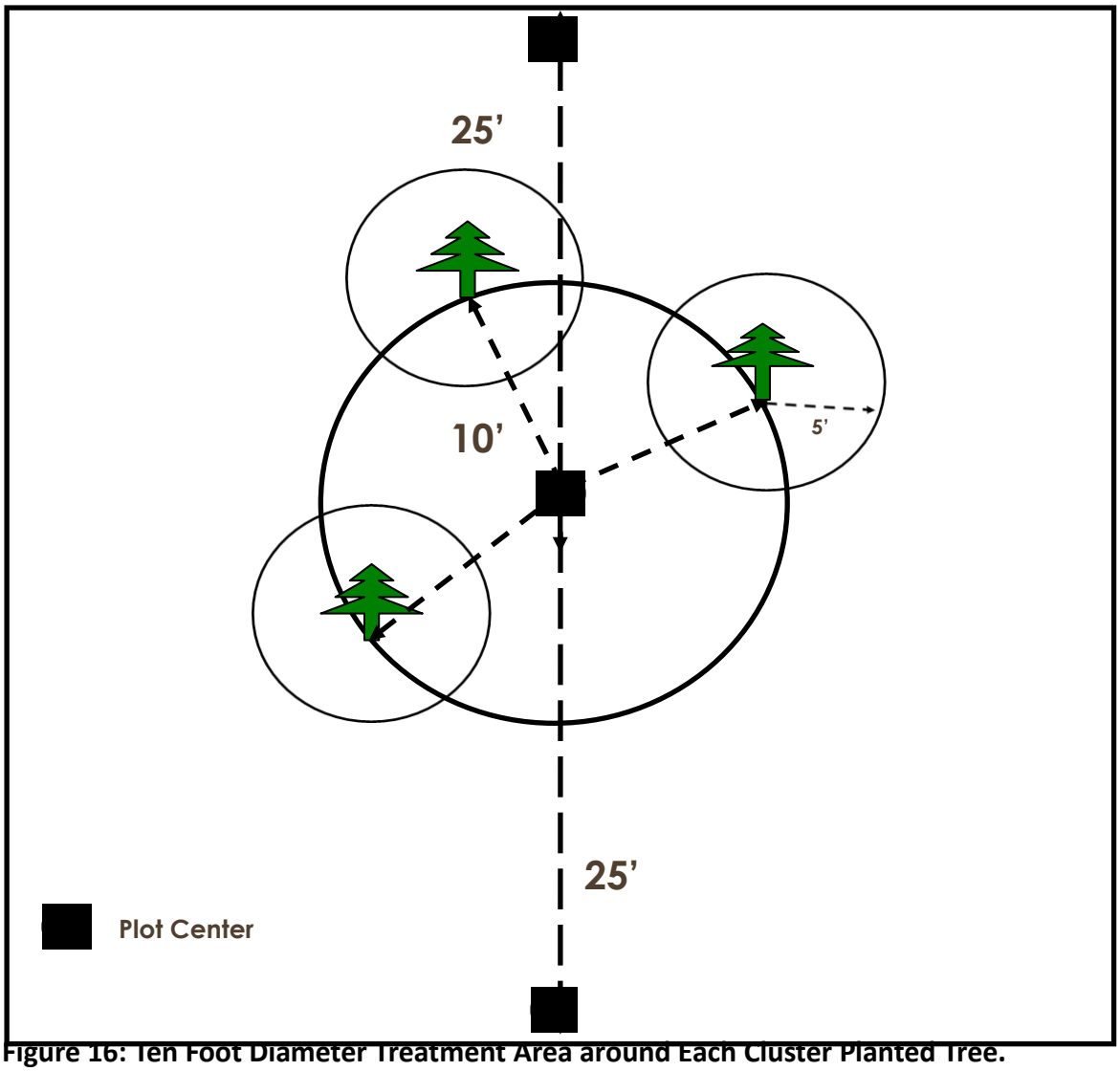


Figure 16: Ten Foot Diameter Treatment Area around Each Cluster Planted Tree.

Pre-Commercial Thinning

When canopy closure begins to impede tree growth, that is when crowns of the regeneration begin to touch, they will be evaluated for pre-commercial thinning. Thinning will space trees out and reduce fuel hazards within the stands. This will also increase individual tree growth and vigor, facilitating the stands to more quickly develop towards older forest characteristics (Franklin et al., 2007). Preference for conifer "leave trees include healthy sugar pine, Douglas-fir and ponderosa pine. In addition to these conifers, a target of twenty to thirty black oak stems per acre, where available, will provide for a more diverse and heterogynous stand. A diversity of species, sizes, and spacing should be maintained where possible to move stands more quickly to a forest of mature growth characteristics. In the event that conifer species are unable to be regenerated due to climate factor, hardwood may be left in higher numbers.

Standards for Pre-Commercial Thinning

Diameter Limit: Planting densities have been designed to develop today the forest of tomorrow. This premise should limit the need for extensive pre-commercial thinning. However, should monitoring actives indicate pre-commercial thinning activities are necessary, cutting of trees shall be limited to trees less than or equal to 10 inches DBH, except in cases of safety, where a leaning or damaged tree must be cut to permit treatment of a project area. Target conifer leave trees should generally be the healthiest trees, favoring those species best suited to the site. Trees larger than 10 inches DBH that have commercial value should be removed in a future commercial entry, or retained for wildlife habitat. Stem densities should be reduced to around 100 to 150 conifer stems per acre when present. In addition to conifers, a target of twenty to thirty black oak stems per acre, where available, will provide for a more diverse and heterogynous stand.

Leave trees: When necessary to thin trees, leave trees shall be spaced depending on crown position in response to the planting design. The objective of tree spacing shall focus on maintaining crown going space. When overcrowding is occurring space trees an average of between 15 by 15 feet to 25 by 25 feet apart, with the narrower spacing for trees less than 4 inches, and the larger spacing for trees greater than 4 inches DBH. Avoid leaving knobcone pine or gray pines unless no other healthy conifers are available. Cut trees include any tree more than one foot in height and up to 10 inches D.B.H. A diversity of species, sizes, and spacing should be maintained where possible to move stands more quickly to a forest of mature growth characteristics. In the event that conifer species are unable to be regenerated due to climate factor, the leave tree species may be modified to leave hardwood trees in higher numbers.

Species Preference: Leave tree preference is as follows: Healthy sugar pine, Douglas fir and ponderosa pine and black oaks. Leaving healthy trees shall take priority over leaving particular species.

First priority leave trees shall be dominants trees which meet the following five tests:

A. Crown class – Dominant, with healthy crowns

B. Bole – Straight and unforked

C. Health – Shall be vigorous and healthy in appearance.

D. Growth – Leader length shall be equal to or greater than that on trees of the same size and crown class.

E. Quality – The limbs shall not be excessively large.

F. Logging and other damage – Only minor damage is permitted. Bark damage shall not extend more than ¼ of the circumference of the tree. Top of the tree shall not be broken out for more than 1/3 of the length of the crown. No more than 1/3 of the live limbs shall have been removed. Damage includes any defect or deformity of a tree resulting from agents such as wind, snow, animals, insects, disease and equipment, and evidenced by such things as dead or broken tops or branches, crooks, deep scars or irregular growths on the trunk (bole) or branches.

Mistletoe – When dwarf mistletoe infections exist, select trees from the species that are not infected. If all species are infected, select a tree using the following priorities:

1st criteria: No mistletoe is visible.

2nd criteria: No mistletoe is growing on or within one foot of the bole.

3rd criteria: No mistletoe is growing within the top 1/3 of the live crown.

Stump Height. Stump height shall not exceed six inches from the ground on the uphill side or four inches above natural obstacles. All cut trees shall be cut below the lowest live limb, except when prevented by natural obstacles. All live limbs below the cutting point shall be removed. Trees shall be completely severed from the stump.

Fire and Fuels Prescriptions

Fire and Fuels thinning will focus primarily in the following high value areas identified by the ID team, community input, and through the Scoping process. The high value areas were identified as:

- areas being commercially thinned, and/or re-forested (or other high investment areas),
- wildlife habitat enhancement areas such as protection of legacy trees (dead or alive) and 100 acre LSR's or activity centers,
- legacy green islands,
- WUI areas and fuel breaks,
- areas adjacent or near private boundaries,
- areas where natural regeneration of tree species are occurring and thinning or release of these trees will help promote stand development, and
- Treatment Buffer Zones.

Results of Mendocino National Forest post fire treatment effectiveness monitoring has demonstrated that treatment buffers around high value areas where a feathered thinning treatment (graded density reduction) has been applied helps modify fire behavior before the fire front enters these areas. For this project treatment buffer zones are defined as areas surrounding any high value area where a feathered thinning treatment may be applied. Feathered treatments may also be applied to individual high value habitat elements such as live legacy trees, snags, or wildlife trees to protect it from future fire effects.

Prescribed Burning Prescriptions

F1 - Prescribed Burning: Prescribed burning is proposed across all vegetation types within the North Shore Project area. Prescribed burning includes vegetation treatments such as: pile burning, jackpot burning, understory burning, and broadcast burning. Treatment activities require control lines to be established to aid in holding efforts. Control lines where possible, utilize existing natural or preexisting features such as ridge

tops or roads or trails. Control lines are created with the minimum necessary width to hold the prescribed burn within a given boundary. They provide flexibility in controlling how much area is burned at any one time. They are also utilized to curtail activities should conditions become unfavorable.

Control lines are typically hand lines accompanied by a wider area cleared of vegetative material with a chainsaw. Hand lines usually require a 2-3 feet wide scrape down to mineral soil accompanied by a 4-8 feet cutting of vegetation to augment the hand scrape. Mechanical control lines would be limited to a width of ten feet. Mechanical treatment is confined to slopes 35 percent or less. Limited to areas where archeological surveys have been completed and cleared for mechanical work. Mechanical control lines erosion control measure for stabilization will follow hydrological guidelines as set forth in the projects Hydrology Report.

F2 - Fuels thinning outside the Ranch fire burn scar: thinning of trees and shrubs <12" DBH Tree's shall be thinned to a 15-25 feet spacing. All shrubs shall be removed unless needed to meet spacing requirements in which case manzanita will be the first choice for shrub retention. An individual shrub or clump of shrubs may be left where trees as sparse and not enough exist to keep from having openings greater than 25 feet. Where no trees or manzanita exist (for example Chamise Redshank Chaparral vegetation type), clumps of chaparral 5-10 feet in diameter shall be retained on a 25-50 feet spacing in areas being thinned. Some areas of chaparral will be prescribe burned only to provide for a mosaic of chaparral age class diversity for wildlife. (LRMP) Mechanical treatment may be applied on slopes <35% and slopes >35% shall be hand treatment only.

F3 - Fuels thinning within the Ranch fire burn scar: thinning of trees and shrubs less than 21" DBH is proposed across the North Shore Project area. Fire killed trees would be felled and material may be piled, chipped, masticated, lopped, or removed off site. Felling operations would be done mechanically or by hand. (Slopes less than35% would be treated mechanically and/or by hand; slopes greater than 35% shall be treated by hand methods only). Trees less than 21" DBH exhibiting less than 0.7 probability of mortality as determined by the Marking Guidelines for Fire-Injured Trees in California (Smith et al. 2011) shall be left at a 15-30 foot spacing. Trees that have more than a 0.7 probability of mortality will be felled unless retention is necessary for wildlife snag requirements.

Large diameter thinned trees may be left on the ground as course woody debris unless fuel loading is excessive. The minimum course woody debris requirements shall still be met.

Mechanical thinning will be limited to slopes that are 35% or less. Mechanical thinning would be used to chip, masticate, mulch or pile vegetation which would then be either removed as biomass or if that is not possible, burned on site or off-site (i.e. in curtain burners).

Hand-thinning will have no slope restrictions. Hand thinned material would either be chipped or piled for removal (to biomass facilities, burn curtains, decks, etc.) or burned.

Hardwood tree release and enhancement (primarily Oak species): thin oaks to 1-3 stems to encourage oak trees to develop in the shape of a tree rather than an oak in the shape and form of a shrub. Prune trees as needed

Thinning of areas that are planted in the North Shore Project or that naturally regenerate shall follow the Silvicultural Precommercial Thinning guidelines.

F4 - Fuels thinning of trees >21" DBH: Fire killed trees 21" and above will be remove where necessary to mitigate future fuel loading. Treatment will be applied to trees that depending on market conditions may have value as biomass products, but do not have a commercial value as lumber products. Trees exhibiting any sign of green shall be retained on a 15-30 foot spacing from trees less than 21" DBH; therefore, not following the marking guidelines for fire killed trees.

F5 – Fuelbreaks:

500 feet Shaded fuel breaks. Fuels breaks would be 500" in width following ridgelines and road systems. Remove all dead trees. Retain live trees at 25-35' spacing. Where live trees do not exist, consider planting to create a "shaded fuel break". Mechanical or hand thinning would be used depending on slope. Prescribed burning shall also be utilized. See treatment F1.

Pre-existing strategic. The same fire breaks have been created and re-utilized many times due to their strategic locations during wildfire suppression actions. Because of their strategic use, the same fire breaks would very likely be used in the future. Maintaining these fire breaks would increase the likelihood of success of these firebreaks. Firebreaks are generally previous dozer lines. These fire breaks would be maintained by keeping them clear of vegetation along the dozerlines. Thinning treatment would be applied to a 500width (generally 250' on each side or adjusted as topography or vegetation dictates) from the center of the dozer line. Thinning shall be on the 25-35 feet spacing encouraging the shaded fuel break concept from above where feasible.

Where no trees exist, shrubs may be kept in clumps no greater than 10 feet in diameter and at a 35' spacing to break up fuel continuity.

(Knobcone shall not be left as a leave tree in any circumstances on fuel breaks and fire breaks. Consider planting native grasses and/or forbs to be manage through prescribed burning. This would be used primarily if a continuous low fire hazard fuel bed is desired to be able to use prescribed fire to keep shrubs from taking over fuel breaks)

F6 - Knobcone management: Focus knobcone management in areas that are accessible such as:

Fuel breaks,

Along roadsides (particularly those that provide ingress/egress for the public as well as employees and fire personnel),

WUI management areas,

High value protection areas,

Buffer zones where a feathered treatment will be applied, and

Where knobcone needs to be managed to reduce fire intensity entering these areas.

Knobcone prescription: Base on location to high value area. Mechanical thinning and prescribed burning multiple times over a short period of time.

Because little research exists on knobcone management, adaptive management process will be critical in this project. Potentially a second or third rotation of a thin/burn/thin may curtail knobcone expansion into other vegetation types. Perhaps there is a potential to develop stands with reduced density of knobcone and higher density of other tree species. While the intent is to manage this species aggressively in key areas high Value areas, we recognize that knobcone also has a role in the natural ecosystem. There are thousands of acres of closed cone cypress vegetation type that will be managed through following the minimal management treatments such as limited to prescribe burning on a more historical fire regime only.

Multiple entries of thinning and burning treatment would likely be necessary in close intervals to discourage cone production and limit fire induced seed germination. To promote root burl survival of hardwood species prescribed fire will be applied at cooler temperatures.

To help develop a stand that is not dominated by knobcone where soil conditions are favorable plant trees that would eventually shade out knobcone trees.

To discourage knobcone form expanding into shurbland habitat develop and maintain a shrubland prescribed fire program. Refer to Fire and Fuels Report.